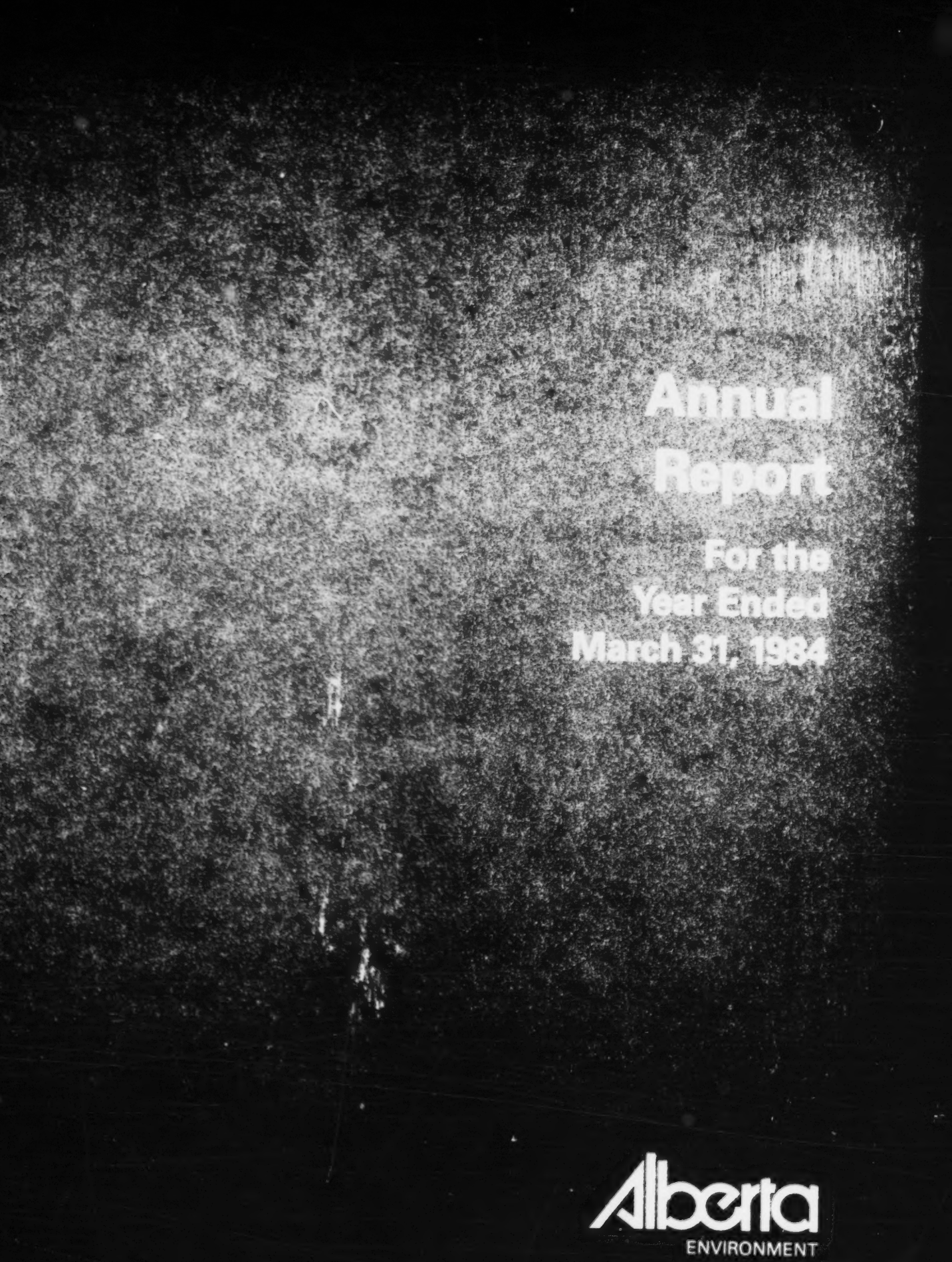
Annual
Report
For the
Year Ended
March 31, 1984
Alberta
ENVIRONMENT

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Alberta
ENVIRONMENT

Annual Report For the Year Ended March 31, 1984

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Alberta

ENVIRONMENT

403/427-2391

Office of
the Minister

132 Legislative Building
Edmonton, Alberta, Canada
T5K 2B6

The Honourable G. Amerongen,
Office of the Speaker,
Legislative Assembly of Alberta

Sir:

I have the honour to hereby transmit the Annual Report of the Department of the Environment for the year ended March 31, 1984.

Respectfully submitted,

Fred D. Bradley
Minister of the Environment

OFFICE OF THE DEPUTY MINISTER

Walter Solodzuk, P.Eng.
Deputy Minister

Sherman Weaver, Ph.D.
Director
Alberta Environmental Centre

Morgan Wartenbe
Director
Personnel and Organization Development

Alberta
ENVIRONMENT

Office of the Deputy Minister

14th Floor, Oxbridge Place, 9820 - 106 Street, Edmonton, Alberta, Canada T5K 2J6 403/427-6236

October 12, 1984

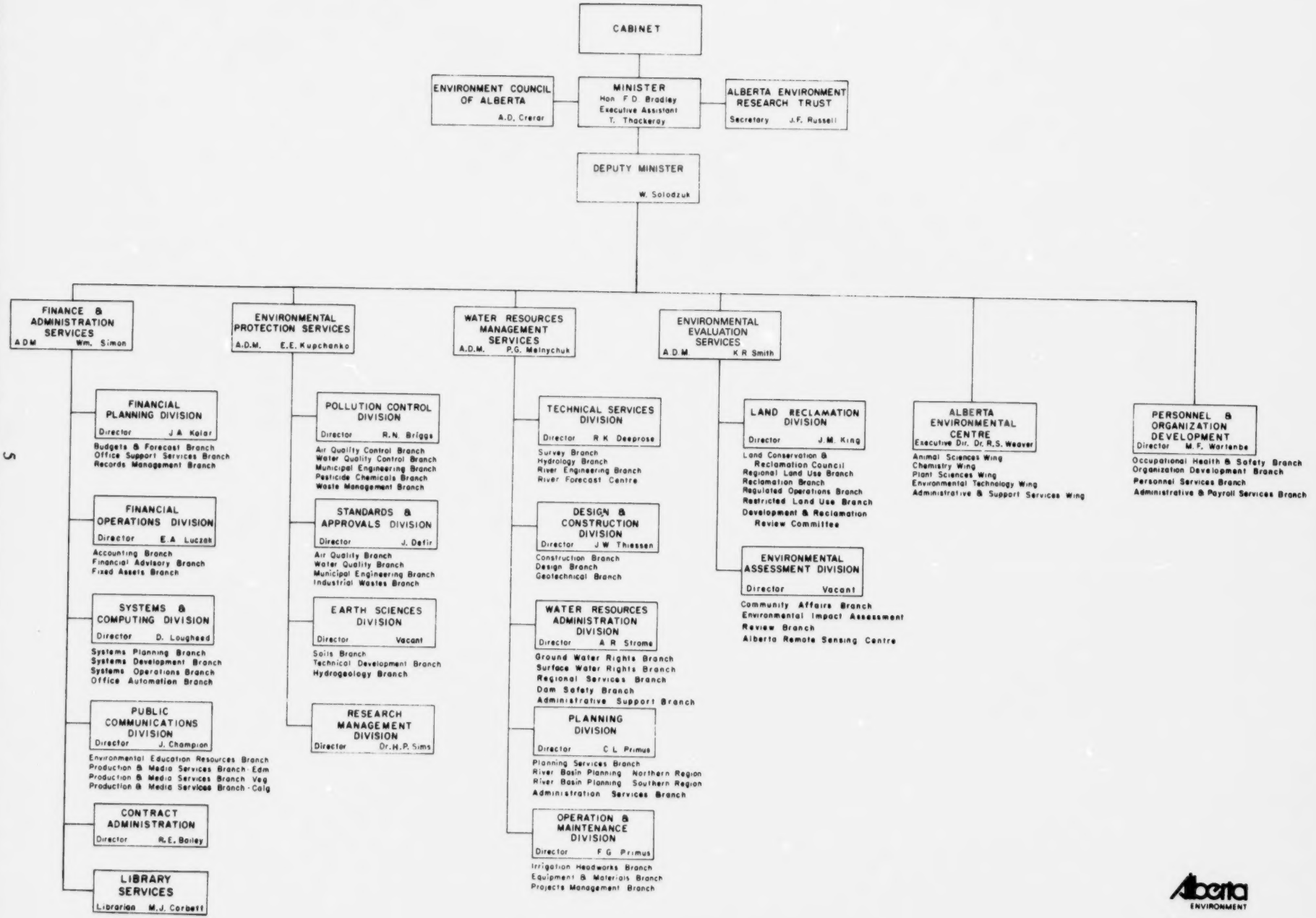
Honourable Fred D. Bradley
Minister of Environment

Sir:

I have the honour to present the fourteenth annual report of Alberta Environment, which covers the fiscal year ending March 31, 1984.

Respectfully submitted,

Walter Sołodzuk, P.Eng.
Deputy Minister



Alberta ENVIRONMENT

MARCH 31, 1984

ALBERTA ENVIRONMENTAL CENTRE

The Alberta Environmental Centre in Vegreville carried out environmental research, technology development and analytical and diagnostic programs for Alberta Environment and other Alberta government departments and agencies.

As the Alberta government's central facility for such work, the Centre may work for any government sector which identifies an environmental question requiring investigation. In practice, major clients were the departments of Environment, Agriculture, Workers' Health, Safety and Compensation, Energy and Natural Resources, the Alberta Research Council and public health units.

Specific projects were carried out following an extensive review by the Centre and the client of project timeliness, relevance and completeness. This was followed by approval by the Centre's interdepartmental Board of Directors.

Increasingly, p iects were approached on an interdisciplinary basis, with experts involved from two or more of the Centre's wings: Plant Sciences, Chemistry, Animal Sciences, Environmental Technology and Common Services. The use of project teams of scientists from several fields was stressed to bring a range of expertise to bear on a particular question.

Some environmental research projects neared completion; for example, the third and final season of monitoring the movements of grizzly and black bears in a northern forest area was completed. The introduction of biological insect pest control agents into the Muttart Conservatory in Edmonton advanced to the point where conservatory staff took over the project.

Research continued in areas such as detection of chemical and pesticide residues in Alberta fish. Findings were used by the client department in recommending safe fish consumption levels. The Centre continued work such as screening new and registered pest control chemicals, sulphur and sulphur gas studies, waste management, water quality improvement and microbiology research.

There was new activity in the study of the reclamation of disturbed Alberta lands. Research programs included developing native plants for use in reclamation and assessing soil constraints on reclamation.

A wide range of analytical and diagnostic services was provided to clients. These included an increasing number of chemical tests performed on air, water, plants, soil and other substances. Drinking water analyses were provided to health units across Alberta, and air analysis services were made available to support Alberta Environment's monitoring and enforcement activities. The analysis program for organic chemicals was refined with the addition of a priority pollutant scan.

Services were also provided in areas such as insect, weed, plant disease and agricultural vertebrate pest identification and the diagnosis of chemical injury to plants.

In the area of technical development, the first field testing of a scrubber to remove sulphur from the stacks of natural gas processing plants was completed. A water treatment plant which recycles 90 per cent of used water was brought into operation to supply the Centre's water requirements. An incinerator was acquired and modified for the study of waste burning technology, and plans were approved for acquisition of a mobile water treatment plant for field studies.

Several environmental surveys were completed, such as on the presence and severity of agricultural pests. Among the findings were that Alberta remains free of Dutch elm disease; however, for the first time, virulent blackleg of canola was found in the province.

Major equipment acquisitions during the year included the computer hardware for a laboratory management system allowing storage and analysis of data produced in Centre laboratories. Twenty-six plant growth chambers were put into operation to allow the study of plants under controlled conditions. A further 10 growth chambers were commissioned at year's end.

The electron microscope purchased in 1982-83 moved into full operation. Some 415 samples were processed for purposes such as

detecting asbestos in drinking water, metals in animal and bacterial tissue and environmentally induced tissue changes.

The major construction activity was a start on the $1.2 million inhalation toxicology laboratory, a facility to contain and manage gases such as hydrogen sulphide and sulphur dioxide which are under study in the toxicology program.

As well as an active round of duties in agricultural extension, staff were involved in several public information and advisory functions, both technical and non-technical. These included the annual Open House, attracting over 500 visitors, and the Centre's first Crops Field Day, where farmers and horticulturists were shown experimental field plots. The Centre's Executive Director spent four months in public hearings as a member of the Lodgepole Well Blowout Inquiry Panel.

Two major workshops were held at the Centre, in addition to the ongoing technical seminar series. The workshops attracted experts from across North America to discuss requirements and procedures for research into waste solidification and pulp mill effluent treatment.

Staff reported findings in major scientific journals and in several Centre-published technical reports. Other significant publications included "Heavy Metals in Natural Waters" and "Weeds of Alberta," a guidebook produced in co-operation with Alberta Agriculture.

At year's end, the staff roster was at 241, including 165 permanent, salaried employees and 24 staff members employed by Alberta Public Works, Supply and Services, who were on site for building maintenance. A major staff addition occurred in January when an Assistant Director was hired.

All of the Centre's work was carried out in eight program areas.

Analytical, Diagnostic, Extension and Technical Services

Most of the Centre's services to the public, both direct and through other departments and agencies, were provided in this program area. Many of the special services required for other Centre activities also came from this group of programs. Nearly half a million analytical and diagnostic tests were performed.

The largest single testing program, mainly for drinking water samples submitted by all of Alberta's health units, was carried out in the Analytical Services (Water) Program. The number of drinking water samples tested rose to over 11,000, continuing the trend of substantial increases since the laboratory was established in Vegreville. Approximately 159,000 individual chemical tests were performed, mainly for the health units.

A further 98,000 water tests were performed on some 3,000 samples collected by staff of the Pollution Control Division of Alberta Environment. Some 1,430 chemical determinations on 719 samples were provided for Centre-managed work, and 200 analyses for cadmium in fish were provided to the Centre. A total of 21,000 tests were applied to 500 samples of water and sediment in support of research on nutrient levels in selected Alberta lakes and rivers.

About 6,000 ambient air and stack samples were analyzed with approximately 16,000 tests. This program provided the air quality data needed by Alberta Environment for monitoring and enforcement of emissions. As well, several test methods to detect substances in air were developed or upgraded. Analytical services were provided for precipitation studies in the province's oil-sands area, involving analysis of 500 rain and snow samples.

In addition to a pesticide analysis program, some 709 samples were tested for trace residues of other organic compounds such as PCBs. This included tests associated with such problems as urban runoff, chemical spills and odor and taste in drinking water.

Demand for insect, weed and plant disease identification and advisory services was strong. These services were provided to district agriculturists, agricultural fieldmen, Alberta Agriculture Regional Crop Laboratories, individual farmers and gardeners and others. The unique chemical damage investigation service provided advice in cases of suspected plant injury from chemicals, using a combination of visual examination, biological tests and instrumental analysis of plant, soil and water samples. Pest control information was supplied through the news media, by presentations to farmers, commodity groups, students and others and by the distribution of extension publications.

Table 1
Diagnostic Services Provided in Plant Sciences
Number of Specimens Processed

	1980-81	1981-82	1982-83	1983-84
Insects	597	592	678	728
Plant Diseases	931	1027	1370	1314
Weeds	360	315	329	502
Chemical Damage	554	730	1085	835

A microbiological identification service was provided to support Centre programs, with some 1,400 samples being processed.

A range of electron microscope services was provided for purposes such as identification of asbestos fibers in public water supplies. Over 400 electron microscope investigations were carried out.

Other services provided both to the Centre and client departments and agencies included electronics maintenance, repair and modification, operation of an interim wastewater treatment plant, laboratory quality control and data management and specialized animal nutrition and pathology services.

Toxicology information services were provided to various groups and individuals through public meetings and a toxicological information base developed in co-operation with the Centre's library.

Some 25 acute lethality tests using rainbow trout were conducted to determine the toxicity of effluent from 10 categories of industry. Three of the tests showed toxic effluent.

Other aquatic biology services provided were participation on a new fish kill investigation team, maintaining five species of fish and start up of the 90 per cent recycling water treatment plant for aquatic research programs.

The geochronology laboratory reached full operational status, analyzing naturally occurring levels of the isotopes tritium and radiocarbon to provide information on the age of materials and the rates of change of processes such as soil erosion.

Pest Management Research and Development

A number of applied research projects were undertaken in the general areas of insect pest, plant disease and weed management.

Several insect surveys were conducted to establish the insects' status as pests. Province-wide surveys of root maggot injury to canola identified the insect as a pest in northwestern Alberta while a swine mange survey showed that the mite responsible is found throughout most commercial hog operations in Alberta.

Surveys were also conducted to improve methods of detecting, assessing and forecasting the populations of established pests. Surveys for elm bark beetles, which carry Dutch elm disease, were completed, and methods of surveying and sampling bertha armyworms and clover cutworms in canola were improved.

Emphasis was on integrated insect management, using biological as well as chemical control. Biological and chemical control of greenhouse whitefly, spider mites, chrysanthemum leaf miner and house flies were evaluated. Field and laboratory studies were initi-

ated on the impact of flea beetle and of root maggot feeding on canola. Experimental chemical application devices for control of horn flies on cattle were evaluated.

Plant disease surveys were conducted throughout Alberta to find newly introduced diseases. One such new disease was the virulent strain of blackleg of canola, found for the first time near Vermilion. Cereal disease surveys in northeastern Alberta indicated leaf diseases of wheat and barley are increasing. However, another survey revealed no incidence of verticillium wilt disease of alfalfa in northeastern Alberta, though in recent years the disease has been found in southern Alberta.

Tests were completed on the chemical control of smut and root rot in barley, root rot in wheat and seedling blight in canola. Field experiments on soil sulphur deficiency and its relation to the disorder "alfalfa decline" were run, and staff began screening alfalfa varieties for resistance to fungi which may also be associated with the disorder. Further studies examined whether herbicides make cereal crops more susceptible to certain diseases, the use of biological agents for apple fireblight and root knot nematode control, the host range for alfalfa wilt fungus and the shoot blight and canker diseases of poplar trees.

An extensive field testing program provided information used in formulating recommendations on use and registration of new and experimental herbicides. These trials examined the effectiveness of herbicides against various weeds and volunteer crops in oilseeds and cereals, crop tolerance to the chemicals and the influence of certain additives on herbicide effectiveness and crop tolerance. The impact of soil carryover of herbicide residues from previous years' spraying on rotational crops was also examined.

Field trials were completed on the influence of various soil and climatic factors on herbicide performance. Further trials, at the Centre and on an oil well site near Redwater, investigated ways of deactivating herbicide residues in soil. Biological techniques for detecting various herbicide residues in soil were also developed.

Weed-crop competition studies were aimed at finding ways of predicting crop losses from weeds and the cost effectiveness of chemical control under different conditions. This included field experiments on the competitiveness of various weeds in barley, wheat and canola and on the long-term economic impact of certain levels of wild oats infestation. Related work studied competitiveness of crops and weeds under various moisture and nutrient conditions; seed germination, growth, development and control of cleavers, hempnettle and scentless chamomile; long-term seed survival; and taxonomy of different leafy spurge types.

Studies on weed control by insects continued with the monitoring of insects which had been released in the field. Five imported insect species were studied for their ability to control leafy spurge and perennial sow-thistle.

Work continued with routine pesticide analysis and development of new ways of detecting residues in water, soil, sediment and vegetation. Regular tests were carried out to monitor pesticide residues in drinking water and other water sources from selected sites across Alberta. Analyses were provided in support of such Alberta Environment programs as Athabasca River blackfly abatement, pesticide container collection and a survey of treated drinking water. Pesticide analyses were also carried out in support of Centre research and diagnostic activities.

Environmental Toxicology

A start on construction of the inhalation toxicology laboratory was a milestone in the development of facilities required for the study of the effects of inhaled substances on animals and man. The facility, due for completion in 1985, will allow large-scale, inhalation toxicology studies to be done. In addition, four custom-designed exposure chambers were tested to ensure they provide proper conditions for inhalation studies. Equipment was also set up and tested for inhalation studies involving air flow measurement, gas mixing and decontamination and gas monitoring.

Preliminary studies were undertaken on the effects of sulphur gases on man and animals, with emphasis on the effects of prolonged exposures at low levels. These included developing biological methods for assessing the effects of inhaled compounds.

Work continued on the effects on livestock of sulphur-containing emissions from industrial plants. In a follow-up to previous on-farm investigations on the relationships between sulphur, selenium and certain livestock diseases, three studies were conducted on the possible antagonism between dietary sulphur and selenium. These involved dietary studies on rats and feeding cattle various amounts of sulphur.

A related study of the effects of a natural gas well blowout on cattle continued with blood collections from farms near a blowout site. Blood from cattle on 10 farms was monitored for one year after the blowout, and various blood enzymes were measured.

Research continued into methods of determining whether certain chemicals cause cancer, mutations or birth defects. Two studies on the effects of chemicals on reproduction in rats were started, and specific test procedures were developed.

A field study, in co-operation with Alberta Agriculture, was continued to determine if there are breed, age or sex differences in the susceptibility of cattle to insecticide poisoning.

The initial focus of an Ecological Toxicology Program was toward identifying potentially toxic chemical residues in Alberta wildlife. Double-crested cormorants were selected for initial study. Eggs and juvenile birds will be collected and tested for contaminants.

Water/Wastewater Research and Development

Work in this program area was concentrated in two general directions — water quality improvement and aquatic toxicology.

A major workshop on the effects of pulp mill effluent on drinking water identified removal and control of effluent colour, taste and odour as topics requiring study. In response to workshop recommendations, a research committee focussed on evaluating colour removal processes and on the effects of effluents on drinking water and livestock. Several approaches to reducing effluent colour were laboratory tested. Processes tested included a commercial bacterial preparation (which proved ineffective), a fungus and a chemical color removal system. In related activities, staff established taste and odor testing facilities and methodology.

A related project was directed toward treatment of waters which receive pulp mill effluent. This required identification of the limitations of conventional treatment and of possible alternate technologies. A mobile water treatment plant was purchased for this and other work on the assessment and development of new treatment systems. Delivery of the test treatment plant was scheduled for mid-1984.

Research on the effects of pulp mill effluent on fish involved tests both in the laboratory and on a river near an effluent outfall site. Evidence indicated that existing effluent regulations were adequate for protecting fish in the river.

In other aquatic toxicology projects, staff attempted to determine which portions of effluents from a fertilizer plant and an oil-sands plant are toxic, thereby providing information useful in developing wastewater treatment systems. In both cases, effluents were separated into their component parts and the toxicity of each part was tested.

A series of tests was conducted to determine the toxicity of substances used to settle suspended solids in wastewater treatment ponds. The tests involved exposing fish to 11 different settling compounds and observing any toxic effects. Evidence indicated that proper use of these substances did not present a major threat to fish.

Staff continued extensive testing of fish from Alberta waters to determine the level of chemical residues present. These studies showed that the levels of pesticides and PCBs residues generally are not a threat to fisheries resources in the province. Studies on the North Saskatchewan River and on six southern Alberta rivers showed elevated mercury levels in some cases. Further studies were carried out or designed to learn more about the sources and behavior of mercury in the environment. Work also started on a study of the levels of certain oils and greases in the Athabasca River.

Waste Management Research and Development

Notable progress was recorded in this program area as several projects moved into full operation. For example, an emission control technology project moved from the literature search and laboratory phases to field testing of a promising process for sulphur dioxide removal from natural gas processing plant emissions. With the co-operation of a mining company and a natural gas plant, a process was tested which uses magnesium oxide for sulphur dioxide removal while producing a potential salable byproduct. Results were very promising, and plans were made for further tests.

A pilot-scale incinerator for both solid and liquid wastes was acquired, tested and modified for research into the best methods of burning certain wastes. Incinerator modifications included addition of a ram waste feeder, monitoring instrumentation, gas samplers, analyzers and treatment equipment.

Agreement to co-operate on waste fixation or solidification research was reached with the U.S. EPA and Environment Canada's CCIW. This followed a Centre workshop attended by representatives of government agencies, research institutions, vendors and potential users from both the U.S. and Canada. The Centre's part in the co-operative study includes an assessment of fixation processes under Alberta conditions, development of tests for the processes and prediction of contaminant release from solidified wastes.

Research on conventional landfill waste disposal focussed on the microbiological breakdown of landfill material which can lead to leaching, gas migration and surface sinking problems. Instrumented test sites were established at landfills at Leduc and Pincher Creek to measure temperatures and landfill gas composition at different depths.

Nine surveys on four feedlots were conducted in a project to provide information on the environmental impact of cattle feedlot wastes on water. The surveys involved collecting 175 samples, with about 1,600 microbiological tests performed, and conducting about 1,600 chemical tests on 40 samples.

Work continued on assessing the potential use of bacteria to remove heavy metals from sewage sludges and, in particular, on the use of bacteria which are able to take up one form of chromium. Following laboratory studies, bacterial toxicity testing procedures were changed to improve the tests. Using these modified procedures, tests were performed on various metals and their mixtures, industrial effluents and experimental leachates.

Research into ways of making better use of wastes such as wood and straw through microbiological processes was carried out. The microbial conversion of straw and Aspen poplar into products for use as animal feed was studied. Preliminary screening was completed on five fungal isolates for their ability to grow on chipped aspen wood without added nutrients.

Living Natural Resources

Some major research activities in this program area neared completion, new ones were considered and others continued.

The third year of live trapping grizzly and black bears for a study of bear populations in the Berland Timber Management Area was completed. This year, 38 individual grizzly and 32 black bears were captured, 30 grizzlies and eight black bears were fitted with radio-collars before release and 89 telemetry surveys were conducted to chart the animals' movements. The trapping program resulted in the development of a series of electronic instruments, such as a remotely triggered movie camera and monitors for bear heart rates and body temperatures.

Related work was aimed at using satellite pictures to classify wildlife habitats and monitor changes in land use and access to the northern forest. This work, in co-operation with Alberta Environment's Remote Sensing Center, involved aerial and ground surveys to test the accuracy of habitat maps.

As research on the Berland Timber Management Area entered its wind-down phase, emphasis shifted to the analysis of information gathered and the writing of reports.

Work also neared completion on a project to evaluate the quality, quantity and distribution of moose browse in the Swan Hills in relation to animal distribution and productivity. With field components of the study completed, laboratory analysis of browse samples and analysis of data were the major activities.

A research system for intensive study of large animals was designed, including electronics and computers for animal testing. Intensive work with captive elk started in preparation for studies such as animal-environment interactions.

Preliminary studies were carried out on the abundance, growth, mortality and reproduction of walleye and pike in Wolf, Ethel and Marie lakes. Fish were caught, and measurements such as size, age and egg production were recorded. The data was collected to provide information on fish populations prior to industrial developments in the area.

Plans were made to participate in studies on the effects of forestry on fish in the Tri-Creeks region. Specific objectives included determining rainbow trout mortality and movement in the study area.

Trials were conducted on control of problem wildlife by chemical and management techniques. These included studies of coyote baiting methods, new chemicals for skunk control and use of various chemicals and baits for pocket gopher control. For example, it was shown that pocket gopher populations declined in a field if broad-leafed plants were controlled in headlands. As well, experiments continued to identify factors predisposing lambs to attack by coyotes.

Staff also drew up research proposals for new studies of moose and fur-bearing animals.

Land Resources Management Research and Development

Major progress was achieved following the hiring of professional staff for the Soils and Vegetation Groups which have primary responsibility for reclamation research and development work. Working with provincial agencies responsible for reclamation research co-ordination, staff planned and started programs of research into the long-term effects of resource development on Alberta's land base.

Preliminary studies began in three areas of soil reclamation research: prediction of mine spoil behaviour as a root-zone material, based on physico-chemical measurements of geological core samples prior to mining; effects of soil and mine spoil compaction on plant growth; and determination of how soil type influences handling procedures in the reclamation of pipeline rights-of-way.

As part of a program of soil analytical services with reclamation and environmental applications, a basic line of equipment was acquired for routine chemical and physical tests. Soil tests were carried out for various Centre projects, and special soil tests for brine spills were performed for client departments. Over 225 locations on the Centre site were sampled in a start of a computer mapping of Centre soils.

Soil scientists began looking for an early warning system to indicate if soils are being affected by factors such as trace metal contamination or exposure to other pollutants. Initially, the nitrogen-fixing capacity of legumes will be studied as an indicator of adverse effects on the plant-soil system. A related study began looking for ways of predicting soil changes from long-term, low-level exposure to sulphur.

In the vegetation area, work was started on developing registered varieties of plants useful in reclaiming and improving lands in sensitive areas such as the tar sands, the short-grass prairie and high-altitude regions. Work was concentrated in three projects: takeover of University of Alberta research to develop commercial varieties of native plants for reclamation at higher elevations; developing ways of propagating native shrubs for oil-sands tailings reclamation; and research on 24 species of native plants for restoring disturbed native short-grass prairie.

A project to select plants suited for right-of-way cover was also approved. As well, a client department request to develop a large-scale instrument to measure water use by forests was received and reviewed.

Administration and Technical Support

Administrative and technical services were provided to support the Centre's scientific activities. Most such services were offered through the Common Services Wing, with some provided by administrative units attached to each of the other wings.

A major responsibility was the preparation of budget documents and the monitoring and expenditure of funds totalling $11.5-million for 1983-84. Support was also provided in purchasing, receiving and storing goods and services, involving activities such as central warehousing and purchasing, processing over 8,000 invoices and implementing various financial controls.

The library continued to play a central role in the collection and interpretation of scientific data through services such as manual and computer-assisted reference searches and collection development. Some 93 in-depth, on-line computer searches were performed. The library processed approximately 532 staff inter-library loans during the fiscal year.

The public demonstrated an active interest in Centre activities. In addition to an Open House attended by over 500 people, 718 people visited the Centre on 67 organized tours. Public information was supplied by distribution of various Centre publications, production of an annual review, participation in the Vegreville Exhibition and through 46 media contacts. A staff newsletter was produced, and 54 orders were completed to meet Centre printing needs.

Recruitment and staff relations were the primary duties of the Personnel Services Section. There were 22 staff commencements and 13 terminations among salaried personnel. The occupational health program is new and growing; an emergency response team was established to deal with emergencies, and a comprehensive health program for all employees was proposed.

Site support staff managed the 750-acre (approximately 300-hectare) site in Vegreville and off-site field base camps, and they maintained equipment such as farm implements, off-road vehicles and a fleet of cars and trucks. Site staff also managed facilities including cultivated land, plot land for crop research, wild and domestic animal housing and paddocks and liquid waste lagoons. Sixty acres (approximately 24 hectares) of shelterbelt and a 10-acre (approximately four-hectare) tree nursery were maintained and developed.

A strategy for providing the computing support services and facilities required by the Centre was developed. The top priority electronic data processing requirement was identified as laboratory information management in the Chemistry Wing. A mainframe computer was purchased, and plans were drawn up for implementation of the laboratory information management system.

PERSONNEL AND ORGANIZATION DEVELOPMENT DIVISION

The Personnel and Organization Development Division provides the department with personnel, occupational health and safety and organization development services through a staff of 18. These include the personnel officer, nurse and support staff located at the Alberta Environmental Centre in Vegreville.

Co-ordinated by the director, the division has four branches: Administrative and Payroll Services, Personnel Services, Organization Development and Occupational Health and Safety.

Administrative and Payroll Services Branch

This branch provides administrative services to the division and is responsible for payroll functions for the department. As of March 31, 1984, the department had 1,178 salaried positions, with more than half located in Edmonton and the remainder in field offices throughout the province. Major field offices are located in Vegreville, Lethbridge, Calgary, Grande Prairie, Peace River and Red Deer.

During 1983-84, 69 salaried and 544 wage employees commenced with the department, 87 salaried and 503 wage employees terminated their employment and 67 were transferred to other departments in the provincial government.

Personnel Services Branch

As a result of the changed economic climate, turnover was reduced. Additionally, department and government constraint measures continued and 31 vacant positions were abolished. The combination of these factors resulted in a reduced number of competitions to 61 from the previous year's total of 174. Although the number of competitions was down, the activity associated with them was significant with responses to advertisements in some cases being more than 300, putting greater pressure on the selection process to determine the best qualified applicants for the jobs. Classification decisions were made on 204 positions in 1983-84, as compared to 185 in the previous year, with the majority being upward reclassification, many in the growth series, followed by regular updating of position descriptions. Some of this increased activity was due to the final stage of the decentralization of divisional and excluded and opted out classes. The department submitted 30 reclassification requests to the Personnel Administration Office for management classes. These requests require prior recommendation from internal Management Classification Committees chaired by this division. Some organizational changes included the split of the Land Assembly Division in August 1983: the Restricted Land Use Branch was incorporated into the Land Reclamation Division, and the Property Acquisition Branch was transferred to Public Works, Supply and Services.

Additional services provided to management and staff include employee relations advice, counselling, exit interviewing and organization review and analysis. Over the year, there was an increase in demand for consultations with managers on organizational changes and job performance issues, including disciplinary measures and grievance handling. As well, there was an increase in activity in employee counselling.

Organization Development Branch

The branch administers programs to enhance organization and human resource development consistent with the achievement of department goals. Accordant with the theme of "doing more with less," the branch co-ordinator encouraged managers and supervisors to be selective in the use of training days and other associated costs. A greater emphasis was placed on the internal delivery of training experiences.

The most significant course which was offered internally was the Zenger-Miller "Supervision" program. The department is licensed to deliver this program and all the personnel administrators, as well as the branch manager, are certified trainers; therefore, the course was offered at the Alberta Environmental Centre as well as at head office. The program is designed to develop incident specific supervisory skills to prepare supervisors for a broad range of supervisor-employee situations. One of the features of the program is the "Management Support Skills" component which provides the participants' managers with techniques for reinforcing their supervisors' newly acquired skills. The evaluations of this program were very positive.

Another new program which was developed and delivered internally was one on meeting skills. This was added to the schedule of other internal programs such as familiarization, stress management, the selection process and performance appraisal. A budget and forecast seminar, designed by an external consultant in collaboration with department specialists, was presented to the department administrative officers.

There was continued involvement in a broad range of external courses, primarily those offered by the Organization Development Division of the personnel administration office. Educational leave was effectively curtailed.

Occupational Health and Safety Branch

The Occupational Health and Safety Branch co-ordinates the department's programs for occupational health, safety and hygiene; provides a professional consultative service to department staff; and serves as the department's primary contact with Workers' Health, Safety and Compensation and the Occupational Health and Safety Branch, PAO.

The Occupational Health and Safety Co-ordinator served on numerous interdepartmental committees reviewing or developing government policy, regulations or procedures relating to health and safety.

In the area of safety, emphasis continued to be on training, development of standard operating procedures and facility/equipment review. The department's accident rate dropped again for the fourth consecutive year and continued to be the lowest of any major department involved in field activity.

Efforts were expanded in the areas of occupational health and hygiene. Numerous environmental studies were carried out at department work sites, with procedural and equipment changes being made as required. Arrangements were made for selected staff to participate in a variety of health related programs, including periodic medical surveillance, pulmonary function testing, audiometric testing, back care and vision care.

FIGURE 1

POSITIONS BY CATEGORY

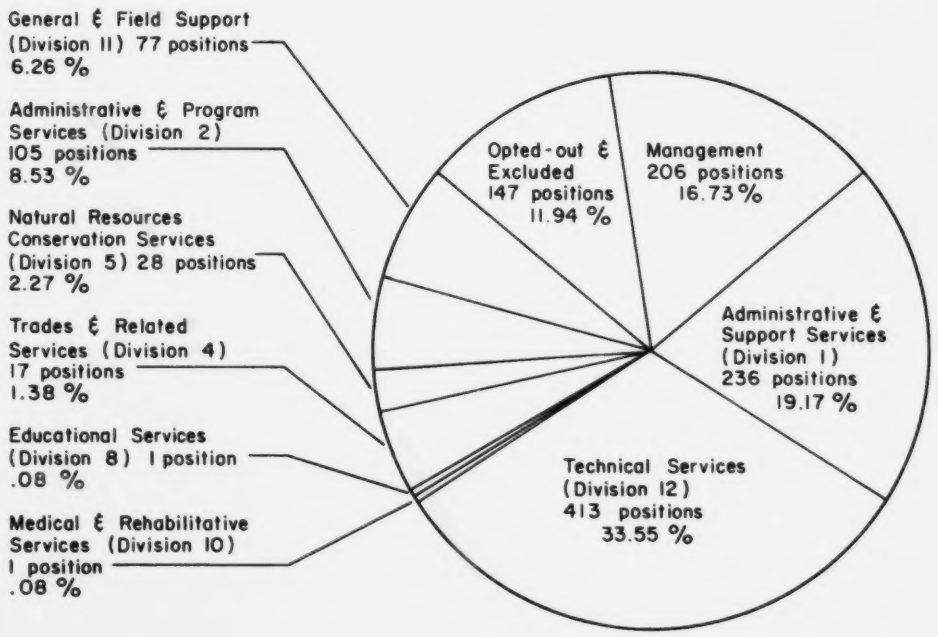

General & Field Support (Division 11) 77 positions 6.26 %
Administrative & Program Services (Division 2) 105 positions 8.53 %
Natural Resources Conservation Services (Division 5) 28 positions 2.27 %
Trades & Related Services (Division 4) 17 positions 1.38 %
Educational Services (Division 8) 1 position .08 %
Medical & Rehabilitative Services (Division 10) 1 position .08 %
Opted-out & Excluded 147 positions 11.94 %
Management 206 positions 16.73 %
Administrative & Support Services (Division 1) 236 positions 19.17 %
Technical Services (Division 12) 413 positions 33.55 %

FIGURE 2

EMPLOYEE LOCATIONS

LOCATION	No. OF EMPLOYEES
EDMONTON	745
VEGREVILLE	189
LETHBRIDGE	133
CALGARY	50
PEACE RIVER	26
GRANDE PRAIRIE	23
RED DEER	23
SPRING COULEE	13
FORT MACLEOD	6
FORT CHIPEWYAN	5
TWO HILLS	4
FORT McMURRAY	3
ARROWWOOD	3
MEDICINE HAT	2
ST. PAUL	2
EDSON	2
CAMROSE	1
ENCHANT	1
HANNA	1
UNASSIGNED	1
WAINWRIGHT	1
WHITECOURT	1
TOTAL	1235

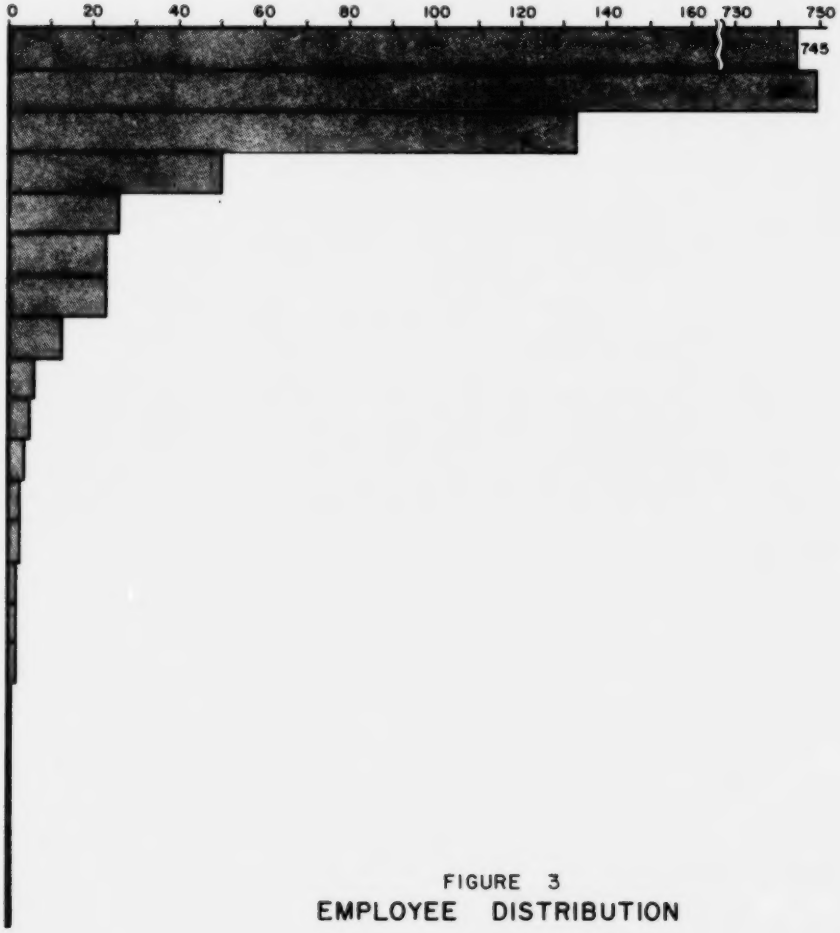
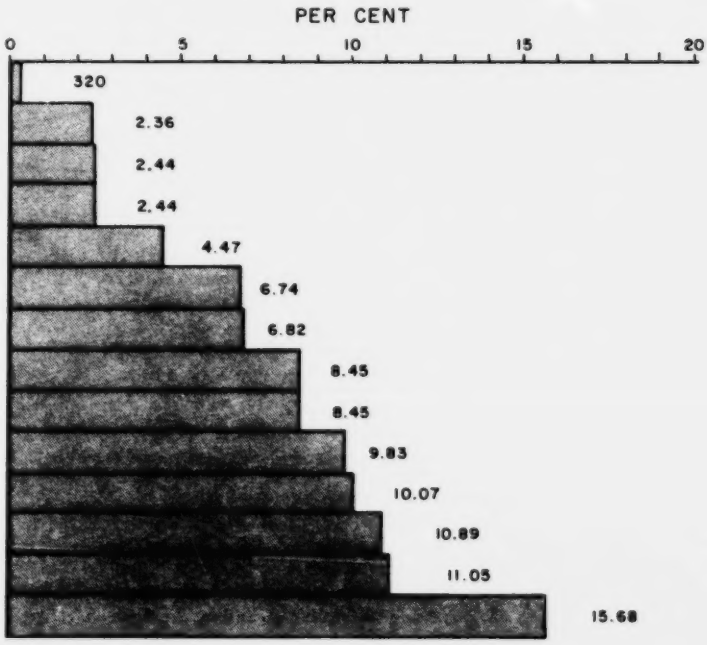


FIGURE 3

EMPLOYEE DISTRIBUTION

	No. OF EMPLOYEES	PER CENT
OFFICE OF THE MINISTER	4	320
OFFICE OF THE DM AND ADM s/ SPECIAL PROJECTS / PER. ORG. AND DEV.	29	2.36
RESEARCH MANAGEMENT	30	2.44
STANDARDS AND APPROVALS	30	2.44
PLANNING	55	4.47
EARTH SCIENCES	83	6.74
FINANCE AND ADMINISTRATION	84	6.82
ENVIRONMENTAL CO-ORDINATION SERVICES	104	8.45
WATER RESOURCES ADMINISTRATION	104	8.45
OPERATION AND MAINTENANCE	121	9.83
TECHNICAL SERVICES	124	10.07
POLLUTION CONTROL	134	10.89
DESIGN AND CONSTRUCTION	136	11.05
ALBERTA ENVIRONMENTAL CENTRE	193	15.68



FINANCE AND ADMINISTRATION SERVICES

William Simon, RIA
Assistant Deputy Minister

J. A. Kolar
Director
Financial Planning Division

E. A. Luczak
Director
Financial Operations Division

Dave Lougheed
Director
Systems and Computing Division

Jacquie Champion
Director
Public Communications Division

R. E. Bailey
Director
Contract Administration

M. Corbett
Director
Library Services

Finance and Administration Services is comprised of Financial Planning Division, Financial Operations Division, Systems and Computing Division, Public Communications Division, Contract Administration and Library Services. These six major areas report directly to the Assistant Deputy Minister of Finance and Administration Services, who is also the senior financial officer of the department and is responsible for implementing the provisions of the Financial Administration Act.

FINANCIAL PLANNING DIVISION

The Financial Planning Division is responsible for the co-ordination of budgetary process, space requirements, subsidized housing requirements, processing of insurance claims, acquisition proposal administration, records management and mail, courier and duplicating services.

Budget and Forecast Branch

The branch was responsible in 1983-84 for co-ordinating and compiling the 1984-85 Alberta Heritage Savings and Trust Fund Departmental Budget for $66.6 million and the 1984-85 General Revenue Budget for $94.2 million.

The branch monitored the 1983-84 Departmental General Revenue and Alberta Heritage Savings and Trust Fund budgets along with co-ordinating and monitoring the Summer Temporary Employment Program (STEP) and Priority Employment Program (PEP).

The branch also works with Public Works, Supply and Services, to provide departmental space needs and with the Risk Management and Insurance Division of Alberta Treasury in insurance matters.

Records Management Branch

The branch is responsible for the development and co-ordination of all aspects of the department's records management program. The Records Manager and Records Clerk provide an advisory and approval service from Edmonton to the department as a whole.

During the 1983-84 fiscal year, significant accomplishments were made in the department in relation to the development, implementation and co-ordination of the records management program.

The most significant accomplishment was the in-house training provided to department staff to familiarize them with the various facets and approved department goals of the records management program. Sixteen courses were presented to a total of 307 Alberta Environment employees.

A master file classification system for all administrative ("housekeeping") records was designed and approved for use throughout the department.

Records disposition excelled with the transfer of 18.2 cubic metres to semi-active (basement) storage; 2.5 cubic metres to the Alberta Records Centre; .1 cubic metres to the Provincial Archives of Alberta; and 17.8 cubic metres for destruction. Next year's figures are expected to be considerably higher due to staff training and co-ordinated procedures being in place.

Retention schedules, identifying how long to keep records and where, were drafted for all administrative records. Once approved (1984-85), the retention schedules will provide significant cost savings for the department by way of reduced equipment, supplies, space and personnel maintenance costs.

A micrographic consultant was secured to evaluate all present and proposed micrographic systems.

Numerous areas within the department received the benefit of consultation from the Records Manager and Records Clerk relating to records systems design, operation, maintenance, equipment and supplies.

Office Support Services Branch

This branch provides the department with a wide variety of supportive services and office materials, including central duplicating services, courier and mail systems, building maintenance and security, telecommunications and furniture, duplicating and associated equipment.

Services and equipment are provided to the department through a central office location in Edmonton and regional offices in Calgary and Lethbridge, with equipment being provided in Red Deer, Grande Prairie and Peace River.

The Office Support Services Branch is the department's point of liaison with Public Works, Supply and Services, for furniture acquisitions, telecommunications and physical building renovations throughout the province. The branch also works with Alberta Public Works in the areas of building maintenance and security, moving and replacing of furniture and requirements for electrical, carpentry and general labor services. The branch's courier services handle pickups and deliveries within the city and, when required, can be reached by mobile radio for emergency pickups.

Central Mailroom processed 3,182 bags and 871 boxes of external mail. As well, central offices' internal mail (departmental in Edmonton only) represented 127.3 cubic metres. Overall volume of mail reached 472.8 cubic metres.

Central Duplicating Operation in Edmonton produced 2,813,612 photocopies, processed 1,290,766 copies through Quick Print and made 33,864 square metres (104,949 copies) diazo printing and 22,508 bound reports and books. Several hundred thousand copies were processed in our Lethbridge duplicating operation.

More than 250 telecommunications and maintenance requests were processed for the department through Public Works, Supply and Services, in addition to a large number of requests for new, additional and replacement furniture.

FINANCIAL OPERATIONS DIVISION

The Financial Operations Division provides centralized accounting and financial services to the department. The division is responsible for the development and implementation of policies, procedures and financial systems required to ensure effective financial management of the department. Support is provided to senior management in the areas of expenditure and revenue accounting, fixed asset control, financial systems development, financial consultancy and internal systems review services to assist in the attainment of their program objectives.

The division is comprised of the following branches:

Accounting Branch

The Accounting Branch develops, implements and maintains departmental accounting and financial reporting systems to ensure operational procedures are in accordance with the requirements of the Financial Administration Act and applicable government policies and procedures. Responsibilities of the branch include the expedient payment of vendor accounts, the accurate recording and reporting of all departmental liabilities, revenues and expenses and the collection of outstanding receivables.

Financial Advisory Branch

The Financial Advisory Branch conducts internal reviews of financial and accounting controls and assists divisional management in the implementation of recommendations. Liaison with the Office of the Auditor General and Alberta Treasury during their audits of the department is maintained to ensure that required internal control procedures are implemented. Financial advisory services are provided to other divisions for the improvement of their financial and administrative systems.

Fixed Assets Branch

The Fixed Assets Branch maintains and monitors a departmental fixed asset control system with objectives being to ensure protection of public property and that management achieves efficient use of fixed assets. The initial objective of physically verifying all departmental assets has now been completed. To ensure the integrity and accuracy of the computerized fixed asset system, a program of cyclical physical counts has been established and is now being implemented.

The branch is also responsible for the preparation of the monthly reconciliations and the annual financial statements for the Surface Reclamation Fund.

SYSTEMS AND COMPUTING DIVISION

The Systems and Computing Division supports all departmental programs in the planning, development, operation and maintenance of computer programs and systems to process a variety of data which the department requires to carry out its mandate. Computing facilities are also provided and department staff are trained to use the equipment and computer programs.

Consulting help and advice is provided to department staff when problems arise or changes are made to keep systems current and operational. The division also administers departmental data-processing activities and co-ordinates the department's data-processing activities with other government departments such as Alberta Public Works, Supply and Services, and Alberta Treasury.

The division is divided into four branches: Systems Planning, Systems Development, Systems Operation and Office Automation. A small administrative section, attached to the director's office, provides general administrative services to these branches and co-ordinates administrative activities such as computer account registration for the whole department.

Systems Planning Branch

The planning branch is responsible for activities such as developing computer system plans, preparing the departmental electronic data processing plans and conducting feasibility studies concerning computer systems.

Systems Development Branch

The development branch is responsible for managing all phases of large- and medium-scale computer systems development and enhancement projects, including developing detailed requirements, designing, programming and implementation. The branch primarily contracts for new systems development and manages consultants and acquires any necessary equipment.

Systems Operations Branch

The operations branch is responsible for ensuring all operational systems are kept current and operational. In addition, the branch develops small-scale projects as time permits. The branch also enhances and maintains all general-use equipment as needed. It also provides a consulting service to departmental members on operational problems.

Office Automation Branch

The Office Automation Branch is responsible for overall development and implementation of computer-based systems used in office-oriented applications such as word-processing, electronic mail and electronic filing systems. The branch also uses the services of the other branches in carrying out its activities.

Current Systems: Over 20 data systems and more than 40 scientific computer programs are maintained in support of 180 users in the department. Air quality, water quality, hydrometric, climatological and groundwater data systems are supported, which in turn support monitoring, assessment and regulatory activities of the department. Routine collection of data on water levels, precipitation and water quality by the department's mini-computer is also supported. A number of technical/engineering computer programs which simulate various hydraulic, hydrometric and atmospheric phenomena are maintained and used by department staff to delineate river floodplains, forecast river flows and predict pollutant concentrations.

Computer programs for statistical analyses, for preparing graphs and for tabulating data are maintained to help technical staff assemble reports.

Support for the preparation of textual material continued, as did training for 27 clerical staff members who use more than 25 word-processing work stations throughout the department. Other non-scientific systems include administrative systems such as the contract registry system, groundwater well system and water resource administration system.

Projects Completed: Some of the projects completed in 1983-84 included installation of an accounting system to improve management of the water resources revolving fund and installation of a complex water quality model to improve water quality analysis. Other projects completed included development of a system to handle information concerning air quality and the water rights information system which will improve processing of water rights licences. An automated data acquisition handling air and water quality and water level information were also completed.

Continuing Projects: Projects to improve the efficiency of office staff, the efficiency of water quality data collection and the handling of water-use information were initiated in 1983-84 and will continue into 1984-85. A major project to automate the handling of chemical analysis data at the Alberta Environmental Centre was also initiated.

Co-ordination and Planning: Data and system technology transfers continued between the department and Environment Canada. These exchanges involved water quality, air-monitoring and hydrometric data. The department has access to indexes of available satellite and air-photo imagery, to data about municipal water and wastewater treatment facilities and to information about special wastes. This information is available via computer terminals using federal agency systems. More reviews of older systems and planning studies for future systems were initiated in 1983-84. These initiatives are being undertaken to insure that computer systems are being used economically and effectively in the department.

The division continued to promote the use of system development standards and promote adoption of changes for more efficient economic development and use of computer systems.

PUBLIC COMMUNICATIONS DIVISION

The Public Communications Division provides services to the department in media relations and communications production and counselling as well as environmental education.

The division administers the bimonthly magazine **Environment Views**. During the reporting period, the magazine examined the topics of outdoor recreation, workplace and home environments, water quality, the coal industry and the environmental movement. Subscriptions to the magazine increased by about 1,227 to a total circulation of around 12,000.

A number of activities were organized for National Environment Week, June 5 to 11, such as displays in Calgary and Edmonton shopping malls, an open house at the Alberta Environmental Centre in Vegreville, advertising and interviews with department speakers on various radio programs.

The department, and environmental issues in general, attracted an increasing amount of media attention. About 55 news releases were sent out and there was an increase in the number of media calls to department staff.

Division assistance to the special wastes program ended with the establishment of the Special Waste Management Corporation. At the same time, the division's education branch began a program to educate school children about the problem of wastes.

The Communications Division handles many inquiries and requests for publications from the public. In 1983-84, 4,252 requests for materials were processed.

Production and Media Services Branch (Edmonton)

Staff in this branch are responsible for writing, editing and co-ordinating production of department publications, advertising and audio-visual aids, assisting with special events, media relations and public inquiries.

Two public affairs officers and a production assistant handled about 238 orders for print materials, photography, advertising, displays, signs and audio-visual presentations. For three months, they were assisted by a public relations student from Mount Saint Vincent University in Halifax.

Among the many projects worked on were the Fort McMurray flood damage reduction study, the Svit-Whitford water management study, an advertising campaign to warn boaters about Eurasian milfoil, production of a film on Dickson Dam construction, public awareness program for Water Resources Management Services, the Annual Report and department publication list and a new program to promote the collection and recycling of used lube oil.

Production and Media Services Branch (Calgary)

A public affairs officer in Calgary provided consultation services in communications as well as technical support in producing brochures, displays, reports and advertising, as well as co-ordinating media relations and assisting with the promotion of special events.

Several major programs during the year included the Blood Indian Irrigation Study, the South Saskatchewan River Basin Planning Program, the Little Bow River Basin Study and the Calgary Weir Safety Program. Produced for these projects were a film, a series of newsletters, a report and brochures, a portable display and a media day at the Calgary Weir.

Production and Media Services Branch (Vegreville)

A public affairs officer provided communications services to the Alberta Environmental Centre in Vegreville. Several special events were organized, including an annual open house which attracted over 500 persons. A crop and garden clinic was held at the Vegreville Exhibition and assistance given to the centre's first Crop Field Day for farmers.

Sixty-seven tours were conducted for 718 people, mainly from Vegreville area schools but also from across Canada and several other countries.

An annual review was produced and distributed locally and to government and scientific communities. A staff newsletter was also produced. Fifty-four print orders were processed, and 46 media contacts were recorded.

Environmental Education Resources Branch

This branch designs environmental education programs, trains teachers and other leaders, prepares educational materials and communicates with other environmental educators in the province.

The branch carried out the solid waste environmental education program (SWEEP) for grades four to 12. Eight units were prepared. Five of the units were in pilot programs in more than 40 classrooms in Alberta and will become part of core curriculum development in 1985.

The water quality monitoring education program expanded to include 30 teachers in more than a dozen communities. Instruction was offered to more than 2,000 high school students per semester in Biology 20-30.

The branch was most active in leadership and training conferences. It sponsored the workshop network, a group of 15 teachers and outdoor leaders on contract to Alberta Environment who provided workshops for teachers and youth leaders throughout Alberta. Sixty workshops were conducted in 1983. Two training sessions were given, one at the Blue Lake Centre and the other at the Capri Centre.

A process skills course was sponsored at the University of Lethbridge. The course offered 15 participants credit through the faculty of education and was a model for a proposed environmental education institute at the University of Lethbridge.

The program, Nature as Classroom, was presented for the second year at the Blue Lake Centre with the co-operation of Alberta Recreation and Parks.

The branch was represented on a tri-partite committee on environmental education (Alberta Environment, Recreation and Parks and Education) which completed the report ***Environmental Education: A Heritage*** for presentation to the Ministers in 1984.

CONTRACT ADMINISTRATION DIVISION

Contract Administration prepares standard contract document formats for each of the various regular activities of the department which are performed by private firms or individuals under contract. Currently, 50 different formats are available for use. Where unique services or unusual agreement content is required, assistance is provided in the contract preparation. Contract Administration also reviews and approves all department contracts and processes for payment all accounts related to contracts.

The following table shows the volume of new contracts and related total dollar value processed in each fiscal year.

	Volume	Value
1977-78	624	$ 23.8 million
1978-79	1,000	$ 31.8 million
1979-80	928	$ 94 million
1980-81	932	$300 million
1981-82	1,092	$281.8 million
1982-83	1,175	$207.7 million
1983-84	913	$ 67.3 million

In addition to the 913 new contracts issued, 562 contractual agreements were still in effect from previous years, making a total of 1,475 active contracts administered during the year and resulting in the processing of 4,856 invoices for a total expenditure of $108.4 million.

A new computerized contract registry system was installed in September, 1983, which provides access to and reports on basic and all financial data on contracts. This has enabled Contract Administration to provide divisions and the department with an expanded level of service and information.

Contract Administration is also responsible for reviewing contracts and purchase requisitions to ensure that Alberta and Canadian firms are being afforded the opportunity to be competitive in the supply of goods and services to government.

Due to a change in policy in the office of Risk Management and Insurance, Alberta Treasury, responsibility for reviewing insurance policies associated with contracts was transferred to Contract Administration.

The Director of Contract Administration serves as one of the two representatives on the inter-departmental Committee on the Public Works Act established by the Minister of Public Works to review and submit recommendations on legislation and contract administration procedure relative to security bonds and third-party claims.

LIBRARY SERVICES

Library Services is responsible for collecting, housing and disseminating information resources for use by Alberta Environment staff. Private industry, members of the public and the university community also make use of its collection. Services provided include the ordering of all books, documents and periodicals for the department, the organization of these materials for maximum retrieval of information, reference queries, interlibrary loan and the enhancement and supervision of regional office library services.

A major milestone was reached this winter with the completion of the conversion of the card catalogue to microfiche format. After an inventory to ensure the accuracy of all records, the card catalogue was removed and replaced entirely by microfiche. The catalogue is also available online and is now publicly accessible on the University of Alberta computing system. Several orientation programs were offered to staff to familiarize them with searching the system, and more are planned for next year.

In keeping with the library's long-range plans for automation, study was initiated on a circulation system. Vendors of commercially available software were contacted, and the merits of their systems were evaluated. Based on the results of the study, a decision will be made in the new fiscal year on the feasibility of automating circulation procedures.

In addition to these projects, the library carried out its regular functions and experienced an increase in use by staff. The most significant increase (33 per cent) was in the use of the library's current awareness services. Total interlibrary loan transactions, 2,938 items, were up slightly from last year, also as a result of greater staff use. Balancing this increase, however, was a decrease in use by private industry. As a result, circulation decreased to 12,000 items, the amount of time spent on reference services declined slightly and interlibrary loans to outside agencies were fewer.

ENVIRONMENTAL PROTECTION SERVICES

E. E. Kupchanko, P.Eng.
Assistant Deputy Minister

R. N. Briggs, P.Eng.
Director
Pollution Control Division

John Defir, P.Eng.
Director
Standards and Approvals Division

L. D. Sadler, P.Ag., P.Eng.
Director
Earth Sciences Division

H. P. Sims, Ph.D.
Director
Research Management Division

The role of Environmental Protection Services is to manage Alberta's environment (air, water and soil) through positive and realistic planning that balances human needs and environmental protection. Monitoring and understanding the nature and interaction of air, water and soil environments, prevention or control of their pollution and development of environmental protection strategies and solutions are the means through which the service fulfills this role.

The development and setting of standards governing the amounts of contaminants that can be discharged to the environment from man-related sources is a major activity of the service. The issuance of permits to construct and licences to operate for industrial and municipal facilities is the mechanism used to implement these standards.

Another key activity of the service is the monitoring of both the ambient environment and contaminant emissions to ensure that air and water standards are effective and being followed. Also, where necessary, compliance with the standards for control of pesticide chemicals and solid waste (municipal and industrial) disposal is enforced.

The service's research activities focus on finding environmental protection solutions which are applicable to a wide range of local environmental concerns, including those related to human interactions with the environment and man's impact on natural biological and physical systems. The service undertakes exploration, inventory and monitoring of groundwater to ensure optimum development and protection of this resource. Information is available to the public through the Groundwater Resource Information Service.

The service also recognizes the need to involve industry, municipalities, outside experts and the general public in its environmental protection activities, and input from these sources is invaluable in developing a practical and meaningful program.

POLLUTION CONTROL DIVISION

The Pollution Control Division enforces various legislation — the Clean Water Act, the Clean Air Act, the Agricultural Chemicals Act, the Hazardous Chemicals Act, the Litter Act, the Beverage Container Act and their respective regulations — to achieve safe and publicly acceptable levels of environmental quality.

Air Quality Control Branch

The purpose of the Air Quality Control Branch is to achieve air quality which is within established standards.

The branch enforces the regulations under the Clean Air Act, the terms and conditions of clean air licences and and is responsible for the general monitoring of the air environment. It maintains an extensive air quality monitoring network and has an intensive program for sampling effluents from stationary sources. Industry is required to monitor its operations, and the branch reviews and verifies these results.

Three air quality directives and one Stop Order were issued for contraventions of the Clean Air Act, and six offenders of the act were prosecuted in the year ended March 31, 1984. In addition, there was one air quality directive issued and two offenders of the act prosecuted in the latter part of the year ended March 31, 1983.

The number of complaints received by the branch in 1983 represents an increase of 12 per cent from 1982 (excluding the Lodgepole well blowout calls in 1982).

Urban Air Quality Monitoring: The air monitoring network for Edmonton and Calgary consists of 65 total sulphation stations, 65 dustfall stations, four fluoride stations, six soiling index analyzers, six high-volume samplers and a total of nine comprehensive continuous air monitoring stations. Each of the continuous stations had instrumentation for the detection of carbon monoxide, ozone, oxides of nitrogen, nitrogen dioxide, sulphur dioxide and total hydrocarbons. Four of these stations are based in Edmonton, four in Calgary and one station is used for monitoring the other major urban areas. An air quality index (IQUA), based on the most significant air pollutants (nitrogen dioxide, carbon monoxide, ozone, sulphur dioxide and smoke) in Edmonton and Calgary, was released daily to the media and general public.

The monitoring network for smaller urban centers consists of one high-volume sampler, 34 total sulphation, 32 hydrogen sulphide, 23 total dustfall and 10 fluoride exposure cylinder stations. A comprehensive survey is being carried out in Ft. Saskatchewan.

Rural Industrial Air Quality Monitoring: The branch operated four mobile laboratories in the Red Deer, Whitecourt, Calgary and Edmonton areas. The laboratories continuously monitor sulphur dioxide, hydrogen sulphide, wind speed and direction. Special air quality monitoring surveys (stationary as well as mobile) were conducted in the Sundre, Little Smoky, Sturgeon Lake, Crossfield, Killam, Ft. MacKay and Fort McMurray areas.

A network of 24 total dustfall, 197 hydrogen sulphide, 206 total sulphation and 10 fluoride exposure cylinder stations are maintained near rural industrial operations.

Monthly precipitation samples related to the assessment of acid rain impact in Alberta were collected and analyzed at six locations: Suffield, Calgary, Red Deer, Edmonton, Whitecourt and Beaverlodge.

Industry Compliance Review: The branch received monthly and annual reports from major industries such as fertilizer, petroleum, gas processing, pulp and paper, meat packing, thermal power, steel, rendering, chemicals, plastics, cement and wood products. These reports were checked for compliance with licence requirements and the branch investigated cases of noncompliance. The amount of data handled is summarized in Table 3:

Table 3

Reports Reviewed Per Year as Required by Clean Air Licences

	1979	1980	1981	1982	1983
Monthly reports required to be submitted as per licence	2,832	3,043	3,182	3,262	3,483
Annual reports required to be submitted as per licence	231	246	276	266	249

Air Pollution Source Monitoring: In 1983, 210 sampling tests were conducted on 54 stacks at 24 plants to assess the air contaminant emission rates from stationary sources and to check compliance with approved limits. A gas chromatograph for on-site source sampling was used to measure vinyl chloride monomer and total reduced sulphur compounds.

Source emission surveys conducted by various industries were reviewed for compliance limits and for acceptability of sampling technique. In addition, approximately 50 source emission surveys, conducted by industry or consultants, were witnessed.

Meteorology: The Edmonton air pollution meteorological station (rural) continued to gather wind, temperature stratification and turbulence data. Four minisondes were released each weekday during the mid-season months to determine complete boundary layer profiles of wind and temperature. A Doppler SODAR (sound detection and ranging) unit was operated continuously to measure the three components of wind and turbulence up to an altitude of 500 metres.

Further improvements were made to a point source sulphur deposition model and a frequency distribution model. Deposition was estimated for three sizes of gas plants and for a gas well blowout. User manuals were prepared for both models.

Other Activities: The branch was actively involved in the public inquiry into the 1982 Amoco Lodgepole well blowout.

The Acid Deposition Research Program, established in March, 1983, is continuing to work toward meeting its major objectives of providing a comprehensive understanding of the effects and consequences of acid-forming gases on the environment and providing a scientific basis for sound, long-term environmental management and regulatory control. The program is being funded and directed by Alberta Environment and industry. Two workshops to assist in the initial planning of the biophysical and human health research programs have been held. In addition, a third workshop on how to inform and involve the public has just been completed. The first research project, a medical diagnostic review in the Pincher Creek area, has recently been announced.

Industrial emission inventories for both the sulphur oxides and nitrogen oxides have been completed.

The update of the sources and emissions inventories for Edmonton and Calgary was initiated and is scheduled for completion early in 1985.

The first year of data obtained with the branch's doppler acoustic radar was evaluated by a contractor. The radar, which went into operation in 1982, measures the three components of wind and turbulence up to an altitude of 500 metres.

Through contract with the University of Calgary, the branch continued the qualitative survey of organic compounds in source and ambient air from industrial areas.

The branch has completed the implementation of a computerized data storage and handling system for all industry reported readings above regulations or air licence limits. These data are entered into the computerized system and can consequently be edited or summarized in regular or ad hoc reports.

A program for developing operational and reporting guidelines for continuous emission monitors on industrial stacks in Alberta has been initiated by the branch. The guidelines are being developed to ensure more uniform operations and better quality assurance of data.

The dry deposition of sulphur dioxide was measured over a ripe barley field by the concentration gradient method. The values obtained were consistent with those currently used in Alberta Environment's point source sulphur deposition model.

Five years of precipitation chemistry data in the province have been evaluated for trends and relationships regarding wet sulphate and wet nitrate deposition rates.

Water Quality Control Branch

The branch's main functions are to enforce the Clean Water Act and regulations dealing with industrial wastewater effluents and to maintain an acceptable level of surface water quality. Activities in 1983-84 included:

Surface Water Monitoring: Monitoring of rivers and lakes in 1983 included baseline studies, biological and chemical assessment of impacts and data acquisition for planning purposes.

The two-year intensive study of the North Saskatchewan River concluded at the end of 1983. Its purpose was to determine the impact of industrial and municipal discharges on the river.

The first year of monitoring the effect on the Bow River of phosphorus removal by Calgary sewage treatment plants began in 1983, marking the final phase of the South Saskatchewan River Basin Study. Effort was also directed toward providing water quality modelling input to the South Saskatchewan River Basin Plan.

An intensive study of the Beaver River began in 1983. Its purpose was to collect baseline chemical data for the whole river relative to future industrial and municipal impacts. The study was designed to provide information to model and/or predict water quality as part of an overall basin plan.

A detailed water quality assessment of the Red Deer River in 1983 had two purposes: to provide a data base as part of the rotational river basin monitoring network, and to assess the impact of Dickson Dam on biological and chemical characteristics of the river.

The newly filled Dickson Reservoir was also sampled in 1983 to monitor changes that are expected to occur as nutrients and metals are leached from inundated soils. Information from this ongoing study can be used to model conditions in other new reservoirs.

Baptiste, Nakamun, Ethel and Wabamun lakes were chosen as type lakes for long-term monitoring. They will be sampled indefinitely on a monthly basis to assess the effects of various factors on cycles of productivity.

A large number of southern reservoirs were sampled to document current water quality. Detailed studies were conducted on Chestermere, Newell, McGregor, Little Bow and Travers reservoirs. More than 40 other reservoirs were sampled at lesser intensity.

A long-term water monitoring program was initiated on lakes situated in provincial parks. This program, conducted jointly with Alberta Recreation and Parks, provided nutrients status data on approximately 15 major recreational lakes.

Long-term monitoring of streams continued in 1983. This work was again contracted out to the Federal Inland Waters Directorate. Monthly samples were taken at 11 sites on major rivers. The samples were subjected to intensive testing by the Inland Waters Laboratory. Major anions and cations were analyzed, along with organics, pesticides and heavy metals. A comprehensive study of the effect of

gas-processing plant operations on Drywood Creek and Waterton Reservoir surface water quality was concluded in 1983. The study included plant effluents, Drywood Creek, Waterton Reservoir and several other water bodies in the area.

A study on the Wapiti and Smoky rivers was also concluded in 1983. The study assessed the change in water quality resulting from a pulp mill operation; both chemical and biological parameters were included in this work.

Industrial Monitoring: The branch completed surveys of 248 industries in Alberta during the year. These surveys included samples for physical and chemical constituents in wastewater. To assess compliance with licence requirements, samples were also secured for fish bioassays testing. A total of 480 samples were taken during the year for analysis.

Monthly and annual reports received from industries were checked for compliance with licence requirements.

The coal-mining industry received the special attention of the branch during the year. The plants were inspected and surveyed on numerous occasions to ensure that the licence requirements for the plants were being complied with.

The impact assessment of the Amoco Gas Well blowout on the surrounding watershed area was completed in 1983. This information was submitted to the Energy Resources Conservation Board Inquiry into the Lodgepole blowout. The branch played a significant role in the inquiry. Approximately one-half of a man-year was dedicated to the inquiry and associated activities.

The Suncor trial continued throughout 1983. The branch participated at this trial, providing information and giving evidence as expert witnesses.

Spills and Complaints: Spills and complaints is another area of branch involvement that required a major commitment of resources. During the year, the branch received 100 notices of spills and 161 complaints, all of which required on-the-site investigations by staff.

Municipal Engineering Branch

The branch's primary responsibilities are to enforce the Clean Water Act and regulations with regard to municipal water and sewage systems and to implement the Regional Utilities Program. Other branch activities include monitoring municipal water and sewage systems, investigating complaints, implementing projects of interest to the province and training and educating municipal water and sewage operators. The branch is divided into three sections:

Field Service Section: This section is responsible for the monitoring, surveillance and enforcement activities of the branch. These activities are undertaken through the main office in Edmonton and regional offices at Grande Prairie, Lethbridge and Red Deer. Table 4 indicated the general level of activity for the section compared to past years.

Table 4

Field Services Section
Activity Comparison

	1981-82	1982-83	1983-84
Inspections	650	900	1180
Problem Investigations	40	57	127
Composite Sampling	53	44	48
Communities Inspected	310	320	366
Semi-Public Facilities Inspected	50	60	64

As in the previous year, the section continued with:

- the treated water survey (10 communities on a monthly basis);
- split composite sewage sampling (four communities on a monthly basis);
- sanitary surveys at Bragg Creek, Lake Isle and Canyon Creek;
- dye studies of several aerated lagoons;
- a comprehensive winter survey of approximately 30 communities for giardiasis ("beaver fever"), with over 350 samples collected and examined; and
- continuation of the screening of potable water at several communities using biological/chemical techniques.

Other noteworthy activities included water quality monitoring on site during the Boy Scout World Jamboree, investigations into iron sequestering using silicate as an alternative to iron removal, the investigation into the causes and remedial measures for higher trihalomethane values in the Fort McMurray water supply, various investigations with respect to the City of Edmonton's Capilano storm-sewer overflow and low chlorine residuals in several treated water reservoirs.

As part of the enforcement activities, a water quality control order was issued to Pinebrook Estates to improve the operation of the water treatment plant and directives were given to Drumheller (water emergencies) and Peace River (septic tank removal). In addition, review of monthly licence submissions continued with an overall water compliance of about 80 per cent and a sewage compliance of about 70 per cent achieved by municipalities. Annual summaries were once again prepared for facility descriptions, water and sewage effluent quality, treated water survey, split sewage composite and bacteriological quality.

As noted from Table 4, general field activities increased substantially. In particular, the number of problem/complaint investigations increased dramatically, requiring significant manpower commitment on an unscheduled basis. Work is continuing on better organization and preparation of the branch and department to respond to both potential war and civil emergencies that might affect municipal water and sewage facilities.

Operator Training and Certification Section: The section is responsible for the development and delivery of an operator training and certification program.

The training program for municipal water and wastewater operators was continued during the year. The object of the program is to provide training in order to upgrade the operators of municipal water and wastewater treatment plants. A total of 12 short courses and seminars and two correspondence courses were given by branch staff. Registration totaled 393 for the short courses and seminars and 54 for the correspondence courses. The operators registering represented 129 different communities in Alberta.

Branch staff provided assistance to Westerra Institute of Technology for the development of a course for water and wastewater operators. The course commenced in January with 24 students registered.

Also, assistance with courses and training material was given to other organizations such as the Western Canada Water and Sewage Conference, the Federation of Associations in the Canadian Environment and the Water Pollution Control Federation.

On January 1, 1984, the mandatory certification legislation that was approved in February, 1982, came into effect. All municipalities having a population of over 1,500 must have certified operators in charge of their water and wastewater treatment facilities. By July 1, 1985, all cities, towns and villages will be required to have certified operators in charge of their facilities. During the year, 274 restricted (no examination) certificates were issued to operators, while 157 operators passed certification exams to qualify for unrestricted or universal certificates.

Regional Utilities Section: This section was responsible for the evaluation and implementation of the Regional Water and Sewage Program. All responsibilities for this program were transferred to the Department of Utilities and Telecommunications on December 1, 1983.

During the previous year under the Municipal Engineering Branch, work continued on the Edmonton Regional Sewage System, with several stages of both the Parkland Sewage Line and the Southeast Sewage Line being completed.

Design and land acquisition continued on the North East Regional Transmission Line. The construction of the Edmonton Regional Sewage Treatment Plant is approximately 90 per cent complete.

The branch continued to provide assistance to the Department of Municipal Affairs on the setting up of regional water and sewer commissions.

Pesticide Chemicals Branch

The branch has responsibilities in three broad areas:

— licensing, training and enforcement (administration of the Agricultural Chemicals Act and the co-ordination and development of pesticide management-training and licensing programs);

— aquatic-terrestrial surveillance (aquatic and industrial vegetation management programs are monitored to determine the impact of control activities); and

— biting fly abatement (administration, co-ordination and supervision of the Municipal Biting Fly Control Financial Assistance Program).

Licensing, Training and Enforcement: The branch licensed 992 pesticide applicators and 457 pesticide vendors. Two hundred and forty-nine permits were issued for the application of restricted or experimental pesticides. Many of these permits covered the use of pesticides in forested areas and water bodies.

Training courses were held in Olds, Edmonton, Vermilion, Airdrie, Smoky Lake, Fairview and Red Deer, with 380 persons attending. Over 300 people enrolled in a home study course for pesticide applicators, while 200 enrolled in a home study course for pesticide dispensers.

One hundred and seventy-one complaints were investigated during the year, and the branch assisted in three prosecutions.

During the year, 1,898 inspections of pesticide vendor outlets, warehouses, permit sites and transport facilities were conducted.

Aquatic-Terrestrial Surveillance: A combined total of 209 permits were issued for pesticide application on, in or near water and on chemical vegetation management in the Green Area. Staff conducted 98 routine site inspections before, during and after the pesticides were applied. Thirty-eight pesticide container collection sites were monitored for possible leaching to groundwater; no residues were detected.

Five monitoring programs were conducted to determine herbicide persistence and movement in forest and aquatic habitats. Four studies were conducted. The first was a study to evaluate the effectiveness of five kinds of physical bottom barriers in suppressing the growth of submerged aquatic plants in lakes (on-going); the second was a contract to determine improved methods of vegetation management in the Green Area (completed); the third was a contract to assess the control options for managing Reed canarygrass in irrigation systems; and the fourth was to determine the effectiveness and dissipation rate of the herbicide Magnacide 'H'.

Two aquatic weed surveys were conducted. One survey was to determine the diversity and abundance of aquatic weeds in irrigation canals; the second was a survey of 47 high-priority lakes and reservoirs to see if the aquatic weed Eurasian Water Milfoil was present. This weed was not found in any water body.

A public awareness program made Albertans aware of the aquatic weed, Eurasian Water Milfoil. Highway and boat launch signs, radio ads, public displays, posters, brochures, bumper stickers and lectures were all used to acquaint Albertans with the weed and the problems associated with it.

Biting Fly Abatement: Department grants totalling $0.63 million were provided to 31 municipalities (population = 1.5 million Albertans) that participated in the 1983 Biting Fly Control Financial Assistance Program. Due to severe mosquito outbreaks throughout the province, control program costs were unusually high during 1983.

Contracts in the amount of $37,400 were processed by this section. Continued support was provided for studies related to biting fly biology and abatement methods.

Branch personnel carried out 175 routine monitoring and inspection checks of biting fly control programs during 1983. As well, several complaints related to biting fly problems and pesticide applications were investigated. Information and technical assistance were provided to abatement programs and to the general public by means of media contact, personal visits, bulletins, seminars and training courses on the safety, management and control of pesticide chemicals and the biology of mosquitoes.

Four ongoing studies were conducted by branch staff: the potential for biological control of mosquitoes using parasites and predators native to Alberta was assessed in one study; the second study determined factors contributing to the production and control of large mosquito populations in conjunction with irrigation; the third study screened larvicides for the pretreatment of mosquito developmental sites; and the fourth entailed the monitoring of the Athabasca River to determine the impact of methoxychlor on non-target organisms. Such studies and continuous monitoring are essential to ensure that more environmentally acceptable measures are being implemented wherever possible in abatement programs.

Special Programs: Seventeen new permanent pesticide container collection sites were added during the year, bringing the provincial total to 72. Over 395,450 containers were collected from the collection sites and the majority of these were recycled at steel mills. Thirty-eight test wells were drilled at pesticide container sites to enable monitoring of possible pesticide leaching to groundwater.

Publications: The ***Alberta Pesticide Handbook*** and the ***Alberta Pesticide Dispensers Manual*** were completed and turned over to Lakeland College for distribution.

Branch personnel provided representation on provincial, federal and interdepartmental committees dealing with the use and disposal of chemical compounds, research priorities and the environmental impact of abatement programs.

Waste Management Branch

The Waste Management Branch is involved in the management of industrial and hazardous wastes and the reduction of waste through resource recovery. The branch administers the Hazardous Chemicals Act, the Beverage Container Act and the Litter Act.

Special Waste Management: Special waste generation and disposal continued to be a major environmental issue in 1983-84. Policies and action strategies for a Special Waste Management Program continued with the naming of a site for a central treatment facility near Swan Hills and the establishment of the Alberta Special Waste Management Corporation, a Crown agency, to manage the Special Waste Management System.

The branch continues to provide technical and financial assistance to municipalities for advanced waste management facilities. In

1983-84, grants were made to the Camrose Regional Waste Authority (City of Camrose, County of Camrose, Village of Bittern Lake), $0.18 million; Beaver Regional Waste Management Authority (County of Beaver, towns of Tofield and Viking, villages of Ryley and Holden), $0.46 million; Big Country Waste Management Authority (Hanna, Youngstown, Cereal, Oyen, Empress, Consort, Veteran and special areas 2, 3 and 4), $1.87 million; Chief Mountain Regional Waste Management Authority (M.D. of Cardston, towns of Cardston and Magrath), $0.4 million; and Sturgeon Regional Landfill, $35,000. As a result of the program, more than 50 open burning dumps will be closed.

The branch also provides information and advice on the safe handling and disposal of hazardous chemicals and wastes and ensures proper containment and clean-up of chemical spills. Advice is given on the restoration of the affected sites.

Resource Recovery: The branch encourages and promotes recycling of waste materials by providing information and technology to industry, municipalities and the public. A grant program is available to non-profit groups and municipalities for recycling equipment such as containers for glass or paper and used-oil collection tanks.

A major aspect of resource recovery is the administration of the Beverage Container Act and the Alberta container depot system. In 1983-84, 205 licensed depots were operating in Alberta for the return of soft drink bottles and cans, liquor and wine bottles and juice cans. Glass, metal and plastic containers returned to depots are recycled into other useful products.

Used-oil recycling advanced in 1983-84 with the installation of four collection tanks, one collection system and the announcement of Alberta's "Oil Drop" Program. Under this program, 350 service stations in Alberta agreed to take oil back from the public.

Paper collection advanced in the province with the advent of four projects for the collection of paper.

Four projects were started in 1983-84 for post-consumer glass in the province, and a facility was established in Edmonton to sort government paper for more effective recycling.

Litter Control: The branch is responsible for the administration and enforcement of the Litter Act. This act allows police and local enforcement officers to issue tickets for littering offences and clean-up orders for unsightly premises. The branch also works with and financially supports Outdoors Unlittered Inc., a nonprofit organization engaged in anti-litter campaigns and educational programs.

STANDARDS AND APPROVALS DIVISION

The Standards and Approvals Division processes applications submitted by industries and municipalities for permits to construct and licences to operate their facilities under the Clean Air Act and the Clean Water Act. The approval criteria for proposed projects reflect currently available technology, with due regard for balancing the cost expended in achieving the criteria and the benefit derived in environmental protection. The division is also responsible for co-ordinating industrial plant site abandonment and developing appropriate criteria for site reclamation.

Air Quality Branch

The prime responsibility and objectives of the Air Quality Branch are to achieve and maintain acceptable ambient air quality through the use of regulations, guidelines and policies applied to industrial and other operations.

A considerable amount of time continued to be spent in assessing air quality impact from new industrial developments and on expansion phases of existing facilities in order to ensure that acceptable air pollution control systems were being applied and used. As required under legislation, assessment of existing industrial operations for relicensing was also a major part of the total workload for the year.

A total of 117 permits and 369 licences were issued under the Clean Air Act during the year (see Table 5), as well as five Certificates of Variance and one amendment. In addition, a total of 16 amendments to permits and 102 amendments to licences (see attached Table 6) were issued.

Table 5

Air Quality Permits and Licences 1983-84

Category	Permits	Licences
Agricultural Activities Including Meat Processing Plants	1	5
Asphalt Plants	3	21
Chemical Plants	5	12
Compressor Stations	17	60
Experimental In-Situ Oil Sand Operations	8	13
Fertilizer Plants	1	14
Gas Processing Plants	71	139
Incinerators	1	62
Oil Refinery Operations	2	6
Power Plants	2	8
Others	6	29
Total	117	369

Staff continued to participate extensively in Energy Resources Conservation Board hearings and inquiries; in addition, the branch was active on several committees dealing with acid rain causing emissions. The branch continued its participation on the National Air Quality Objectives Sub-Committee, contributing to the development of criteria documents and ambient air quality objectives.

The deregulation of minimum impact applications is being considered, particularly for small sweet gas processing plants. However, this was not finalized by year end.

An extensive field survey was carried out on compressor engine installation to check the accuracy of information supplied in applications as compared to what was actually built.

Table 6

Amendments to Air Quality Permits and Licences 1983-84

Category	Permits	Licences
Agricultural Activities Including Meat Processing Plants	0	4
Asphalt Plants	1	4
Chemical Plants	3	6
Compressor Stations	1	5
Experimental In-Situ Oil Sand Operations	2	8
Fertilizer Plants	1	4
Gas Processing Plants	6	57
Incinerators	1	1
Oil Refinery Operations	0	6
Power Plants	0	2
Others	1	9
Total	16	106

Water Quality Branch

The assessment of plant performance data and liquid effluent quality characteristics were main areas of the branch staff involvement, particularly for those industrial sectors requiring reissuance of five-year licences.

To protect the various beneficial uses of water resource demands (potable water supply, aquatic life, industrial, agricultural and recreational) a procedures and methods brochure was prepared to assist industrial proponents in completing applications under the Clean Water Act. Additional effort was expended with respect to leachate and seepage control from industrial waste water impoundments, sulphur block storage and industrial land fill sites. The branch continued to participate in water quality issues dealing with color reduction technology, river basin planning scenarios and predictive modelling programs, water quality requirements at the prairie provinces interprovincial monitoring stations and the Canadian Surface Water Quality Guidelines.

A total of 90 permits and 334 licences were issued for the construction and operation of industrial facilities (see Table 7). Thirteen Letters of Permission were also issued, authorizing the temporary release of liquid effluents under controlled conditions. Fifteen projects were exempted from having to obtain environmental water permits and licences.

Forty-nine new applications for Certificates of Compliance were received for large livestock operations in the southern part of the province. Fifteen certificates were issued from these applications. Seventeen certificates were issued from 33 applications received in the northern region. Continued assistance was provided for a microbiological research study relating to feedlot operations, conducted by the Alberta Environmental Centre.

Municipal Engineering Branch

The major responsibility of the Municipal Engineering Branch is to ensure that municipal water supply systems and sewage works provide a high level of both public health and environmental protection. This is achieved through

— the review and approval of engineering reports, plans and specifications for all municipal water supply facilities, sewage works and stormwater systems in the province;

— the updating and development of standards for municipal water supply facilities, sewage works and stormwater systems; and

Table 7

Water Quality Permits and Licences 1983-84

Category	Permits	Licences
Asphalt Plants	2	21
Chemical Plants	7	12
Coal Processing	7	60
Concrete and Cement	0	13
Fertilizer Plants	0	14
Fiberglass	0	0
Food Processors	0	0
Gas Plants	54	121
Meat Packing and Processing Plants	1	6
Oil Sands Plants	1	6
Petroleum Refineries	4	4
Power Plants	1	5
Pulp Mills	0	2
Salt Caverns	1	1
Sand and Gravel Washing Plants	4	9
Snow Disposal Sites	0	3
Tar Sands	0	1
Wood Processing	0	1
Miscellaneous Facilities	1	4
	83	283
Amendments	7	51
Total	90	334

— the establishment of specific performance and operating standards and conditions for both water treatment and sewage treatment plants.

The review, approval and licensing of all municipal water, sewage and stormwater projects undertaken in the province continues to be the main activity of the branch.

A total of 242 permits to construct and 32 licences to operate were issued for the construction and operation of municipal systems (see Table 8). In addition, 75 certificates of compliance relating to the satisfactory completion of permit conditions and 18 letters of permission authorizing land application of either sewage effluent or sludge were issued.

Table 8

Municipal Engineering Permits and Licences 1983-84

Category	Permits	Licences
Water Supply	59	9
Sewage Treatment	46	23
Water and Sewer Extensions	113	—
Storm Sewer Systems	24	—
Total	242	32

The development of guidelines, design manuals and technical reports continued to be a major activity of the branch. A booklet entitled "Sewage as a Resource" was prepared in response to the growing interest in land application of sewage effluents and sludge. Reports on alum sludge treatment and disposal and on fluoride

removal technologies were commissioned. The branch also participated financially and technically in studies on the biological removal of nutrients from sewage and on the factors affecting flow velocities in gravity sewer pipes.

Drinking water quality standards continued to be a topic of major public interest, and branch staff represented the province at two federal-provincial working group meetings on drinking water quality standards.

As in past years, branch staff spent a large amount of time assisting municipalities and their engineering consultants with the planning, selection and design of water supply systems and sewage works. Input was also provided to the Department of Utilities and Telecommunications on municipal projects being considered for financial assistance under the Alberta Municipal Grant Program.

Industrial Wastes Branch

Branch staff responsibilties included routine review of applications for industrial waste disposal of land, including land filling, land farming and deep well; review of applications for approval of in-situ heavy oil experimental schemes; inspection of relevant plants on behalf of the Atomic Energy Control Board; participation on the Federal-Provincial Consultative Committee on Low-Level Radioactive Waste Management; training of visible emission readers; and supply to the general public, upon request, information on disposal methods for industrial wastes.

A draft of the proposed regulations and guidelines for Managing Hazardous Waste was distributed to industry and the public for comment.

EARTH SCIENCES DIVISION

The Earth Sciences Division is responsible for a diversity of projects including hydrogeologic investigations, inventory and applied research in soil and groundwater protection, waste disposal and groundwater development.

Divisional activities continued to be directed to current concerns of Albertans, as well as to improving established programs and services.

The culmination of two years of work came with the ministerial announcement of the selection of the Windy Lake site near the town of Swan Hills for the special waste treatment and disposal facility. Staff managed the contract for the hydrogeologic component of the site investigation.

The enhancement of the groundwater observation well network was continued by the addition of several new wells. A study was initiated into the applicability of electronic data processing for continuous recording of groundwater data.

The completion of the extensive provincial groundwater resources information file on microfiche resulted in a number of side benefits, including preparation, on a provincial scale, of maps showing flowing wells and shot-holes.

Soil acidity research and monitoring work continued on a number of fronts. An important acidity related component was initiated with plans formulated for a contract with Alberta Research Council to prepare a map of the province showing the distribution of soils sensitive to acid deposition and the capacity to neutralize acid depositions.

A major study of the soils and groundwater around Keho Lake was completed. The report will be used as a base for future damage claim assessment, if new saline areas develop subsequent to raising the water level of this irrigation reservoir.

Direct public service to individuals was a high priority for all three branches.

Staff changes during the year included the early retirements of the Director and the Head of the Technical Development Branch. Both the vacancies created were filled by departmental competitions and promotions of senior divisional staff.

Hydrogeology Branch

The Hydrogeology Branch consists of five sections responsible for exploration and inventory, geology, groundwater information, engineering and groundwater technology. The branch is actively involved in hydrogeologic mapping, geophysical monitoring, groundwater impact assessment, investigation of domestic and municipal water well problems, liaison with the water well drilling industry and compilation of groundwater information. Major accomplishments include delineation and evaluation of major groundwater sources in the Cold Lake area, enhancement of the observation well network, and development of microfiche files.

Observation Well Network: To modernize the observation well monitoring program, testing was started on a combined state-of-the-art electric pressure transducer with a stand-alone data logger. If the assessment of this method of monitoring proves it to be satisfactory, reductions in well construction costs, improved low temperature performance and computer data manipulation capability will result. To reduce field time, several new strip-chart automatic water level recorders were obtained that can function unattended for up to six months. Work is progressing favorably in acquiring new wells to monitor, particularly after a consultant's comprehensive review of reports and files identified the number and status of wells drilled for, or by, the department.

Cold Lake Regional Hydrogeological Study: The results of groundwater investigations and computer-based modelling in the Cold Lake area were submitted to the Planning Division as part of the Beaver River Basin study. Additional drilling inside the Primrose

Lake Air Weapons Range has clarified the groundwater potential of the Sinclair buried channel aquifer. A bedrock topography map of the Cold Lake area was published in co-operation with the Alberta Research Council.

Turtle Mountain Study: The rockslide monitoring research, which has been progressing since 1980 at Turtle Mountain in the Crowsnest Pass, is now being applied to the eastern slopes region. The Earth Sciences Division is participating in a reconnaisance of potential rockslide hazards in the transportation corridors and user areas in Kananaskis Country.

Groundwater Information: The Groundwater Resources Information Service responded to 2,772 enquiries during the year, an increase of 60 per cent over last year. The service has incorporated microfiche as the primary medium for transferring technical data, resulting in a more efficient and cost-effective program. Updated incoming data such as drillers' logs and hydrogeologic reports are available monthly on microfiche or daily on paper copy.

The complete groundwater data file was made available to the private sector, at cost. This resulted in a number of favorable side-benefits, including compilation and province-wide mapping of flowing shot-holes and flowing wells by private industry.

The information service is recognized by all levels of government and the private, public and consulting sectors as the primary data bank for groundwater and related information.

Table 9

Hydrogeology Branch Programs

Programs	1982-83	1983-84
Groundwater Administration:		
Driller Licences Issued	238	256
Driller Inspections	619	633
Well Complaints	100	76
Drillers' Reports Submitted	5856	5661
Information Requests	1739	2772

Soils Branch

The Soils Branch is engaged in a diversity of programs with a common theme of describing the soils, geology and groundwater regime in primarily the upper 15 metres of the earth's surface. In 1983-84, emphasis was again placed on hydrogeologic evaluations of potential sites for hazardous waste facilities, landfill siting and monitoring and irrigation headwork studies.

Hazardous Waste Project: Responsibility for co-ordinating the hydrogeologic investigations of potential sites for a hazardous waste treatment facility continued. Preliminary hydrogeologic office evaluations were completed on five sites (1280 ac; 518 ha) in Improvement District 17 and one site (160 ac; 65 ha) in the County of Strathcona.

A consulting firm, supervised by the branch, completed detailed hydrogeologic reports on five sites: the Consort and Veteran sites in Special Area 3, the Youngstown site in Special Area 4, the Ryley site in the County of Beaver and the Windy Lake site near the town of Swan Hills in Improvement District 17. All of the sites were rated as hydrogeologically suitable for the establishment of a hazardous waste treatment facility.

Landfills: There was an increase in the number of regional and modified landfill sites investigated during the year. The primary purpose of the program is to assess existing hyrogeologic site conditions and thus ensure that landfills are developed where the risk of groundwater contamination is minimal. Assistance in site selection is facilitated by site selection maps, office evaluations and site specific testing. Major site investigation reports describing the hydrogeology for regional landfill sites proposed at Ryley, Taber, Camrose and Ross Haven were prepared.

Groundwater monitoring systems have been established at 10 regional landfills to safeguard against contamination. At each landfill, water levels are recorded twice annually and groundwater samples are collected for chemical analysis once annually. At many sites, sampling has been expanded to include analysis for polychlorinated biphenyls (PCBs), mercury and hydrocarbons. The duration of monitoring at each site is contingent upon the contamination potential. Reports describing monitoring activities at the Sedgewick (County of Flagstaff) and Leduc (County of Leduc) regional landfills have been prepared in the past year. In addition to the regional landfills, groundwater monitoring studies were conducted at numerous modified and smaller waste disposal sites. These studies involved installation of the monitoring system, data review and preparation of a short report. Studies were conducted at the Ardrossan, Rolly View, Looma, Alix and Cardiff waste disposal sites.

Irrigation Headworks: The irrigation headworks program is administered through the Lethbridge office. It involves soil and shallow groundwater studies along the main canals and reservoirs operated by the department in order to determine the locations and extent of existing and potential seepage problems. Emphasis has once again been directed toward ongoing rehabilitation and enlargement of the LNID and SMRID main canals and storage facilities. Branch inputs relate to recommendations involving canal lining, groundwater interceptors, subsurface tile drain relief systems and other soil and water investigations related to the effective control of canal seepage. Engineering design inputs on drainage criteria are also provided.

Major reports were filed for two reaches of the LNID system as specified under the five-year rehabilitation program. A detailed groundwater (local and regional) study was completed for the proposed Keho Lake enlargement project. Other studies undertaken include investigation of seepage complaints on the SMRID, Mountain View-Aetna, Western and Bow River main irrigation canals. Post construction monitoring and evaluation studies were also initiated for two major rehabilitation contracts recently completed for the LNID and SMRID systems.

Dryland Salinity: The severity and continued increase in soil contamination caused by dryland salinity problems are major concerns to farmers, particularly in southern Alberta. In co-operation with Alberta Agriculture and Agriculture Canada (PFRA), the branch has been providing an investigative service to the Dryland Salinity Control Association, mainly in the County of Warner. During the past year, local associations have been formed in three additional counties and municipalities and have started applying for similar services. Investigative work was carried out on 23 land parcels to determine the groundwater recharge areas and to recommend control measures.

Shallow Groundwater Contamination: The branch continues to provide an important inter-divisional consultative service dealing with shallow aquifer contamination from industrial sources. In the past year, problems have been resolved at one plant while monitoring continues at a second site. At two other sites, the branch continues to provide assistance in monitoring on-going groundwater rehabilitation projects.

Fourteen new cases of gasoline leakage were investigated, with the branch conducting exploratory drilling and monitoring programs at six of these sites. The drilling programs were undertaken only when the leakage source could not be readily identified. Monitoring continues at two other sites where gasoline contamination caused problems in both public and private buildings.

Country Residential Subdivisions: A total of 95 technical submissions supporting country residential subdivision applications were reviewed and evaluated. The branch is responsible for the assessment of available groundwater supplies and the suitability of subsoils and water-table conditions for the establishment of onsite sewage treatment systems.

Rural Water Development: An adequate supply of good quality water is required in rural areas for domestic, stock and irrigation purposes. In parts of the province, particularly in southern Alberta and the Peace River district, it is not always possible or convenient to obtain water of suitable quality from wells. In these areas, dugouts or small dams are used as a source of supply. For a number of years, the branch has provided an investigation service to rural residents to determine the suitability of the soil material to retain water in proposed impoundments or the cause of seepage from existing ones. This continued to be a popular program, with 190 sites being investigated (46 of these were in the Peace River area).

Table 10

Soils Branch Summary of Services

Programs	1982-83	1983-84
Landfill siting:		
Site Selection Maps	11	6
Modified Landfill Evaluations	49	78
Regional Landfill Evaluations	30	53
Monitoring	16	10
Groundwater Contamination:		
Sewage lagoon appraisals	39	24
Rural water development (dugout tests)		
Central Alberta	—	3
Southern Alberta	159	141
Peace River district	38	46
Country residential:		
Subdivision Appraisals	138	95

Technical Development Branch

The Technical Development Branch, which has capabilities in soil chemistry, physics, microbiology and environment chemistry, engages in activities addressing the general field of soil contamination prevention.

Soil acidification research and monitoring continued as a major program. Additional established programs related to land treatment of wastes, reclamation of disturbed lands and analytical services were maintained. Involvement in these areas occurred in various technical capacities including investigations, research reviews, data interpretation and consultation.

Waste Utilization: The practice of domestic and industrial waste and wastewater application to land as a means of use or treatment of the waste is now widely accepted. Investigations to assess the suitability of wastes and soils for land application were conducted by the branch.

Requests for land application of domestic wastewater and sludge from municipalities in the Peace River and Red Deer River regions were addressed. A summary report entitled "Municipal Wastewater Assessment for Irrigation in the Red Deer, Bow and Eastern South Saskatchewan River Basins" is nearing completion. Land application proposals were received and reviewed for varied industrial wastes and wastewaters; for example, distillery, sour gas plants, petroleum refineries and oil field drilling operations. Staff involvement continued in co-operative studies related to land application of saline drilling fluid residues and oily sludges.

Reclamation: Long-term field studies at the Bow City strip mine site were continued. A study was maintained to assess various treatments for their ability to improve sodic mine spoil. Completion of a four-year investigation into the effects of prolonged storage of stockpiled topsoil has shown that degradative changes with respect to soil microbial properties and nitrogen status have occurred. A current project involves investigating the use of bottom ash as a barrier to upward salt movement from sodic spoil.

Soil Acidification: Major effort was directed toward initiating new and continuing established studies under this program. A detailed study examining the effect of acidic additions on soil properties was continued. Parameters which are critical and predictive with respect to soil acidification were identified. Methodology required to measure such parameters were developed and refined. Two additional new long-term soil acidification monitoring sites were established at High Prairie and Ester, bringing the total number of such sites to six. To assist in the sour gas plant soil monitoring program, a study undertaken to assess variability in soil pH measurements was continued. Sampling time and methodology were investigated as possible sources of variability. Statistically significant yearly fluctuations in pH were observed and reported for calcareous soils. A contract to prepare a map of Alberta which defines soils sensitive to acidification was initiated with Alberta Research Council. In progress are studies to investigate the effects of acidic additions upon the phosphorus status of soils.

Analytical Services: Laboratory analyses of soil, water, plant and waste samples were conducted for the Earth Sciences Division as well as for private and other government agencies. A summary is outlined below:

soil chemistry parameters	100,164
soil physical parameters	2,977
water chemical parameters	47,917
microbiological parameters	729

RESEARCH MANAGEMENT DIVISION

The objectives of the Research Management Division (RMD) are:

- to provide timely and authoritative scientific and technical information to other operational divisions within Alberta Environment;
- to plan and co-ordinate the scientific environmental research planning requirements of the department; and
- to carry out research on environmental matters which is pertinent to departmental and provincial needs.

In order to carry out these objectives, the division combines diverse skills such as project management, budgeting and financial control, contracting and publication editing with comprehensive knowledge in many scientific areas pertinent to the field of environmental research. The division's expertise, which allows for a comprehensive approach to environmental problem solving, is drawn from such areas as hydrology, climatology, pedology, biology, meteorology, ecology and sociology.

The organizational structure of RMD merges a functional management mode comprised of four scientific systems or groups (air, human, terrestrial and aquatic) with a matrix system based on a number of well-defined scientific research programs. The prime advantage of this structure is its flexibility, allowing for an interdisciplinary approach to certain environmental problems. For instance, the division's work in the area of acid deposition includes research on the complex interface between the atmosphere and biosphere, that is, how air quality affects soils and vegetation.

During the 1983-84 fiscal year, the division's research programs included:

- the Alberta Oil Sands Environmental Research Program (AOSERP),
- acid deposition,
- environmental assessment,
- environmental contaminants,
- reclamation,
- socio-economic (environmental information), and
- waste management.

AOSERP was initiated in 1975 to investigate the potential environmental effects of industrial development in the Athabasca Oil Sands. At that time, the program was confined to a specific study area which has since been expanded to include other oil-sands areas, most notably Cold Lake. To support AOSERP research, the Research Management Division operates the Mildred Lake Scientific Research Facility, consisting of laboratory and camp space for project and scientific staff working in the Athabasca Oil Sands area.

As RMD's programs are developed, each is defined by a comprehensive description document that is updated regularly in order to keep its objectives current. Environmental concerns in Alberta are continually being examined and may be incorporated into the division's active programs, or new programs may be developed. As well, in this updating process other programs may be terminated. Budget funds are allocated to each of the programs on the basis of priorities determined by Alberta Environment.

In its research service role within Alberta Environment, the Research Management Division aids in the co-ordination of all of the department's environmental research and ensures that the available research dollars are well spent on activities that respond to high priority needs. To this end, RMD acts as a co-ordinator for research carried out on behalf of the department at the Alberta Environmental Centre in Vegreville. As well, divisional staff constantly interact with other line divisions of Alberta Environment in order to keep their programs current and of direct applicability to the department.

In its research management capacity, the Research Management Division actively manages or oversees a number of environmental research projects. As a rule, proposals for projects are solicited by RMD as research needs are identified and terms of

reference developed. However, proposals may also be submitted through other divisions of Alberta Environment. All are reviewed in the light of departmental objectives and the division's program requirements.

During the fiscal year, the Research Management Division managed 55 contracts, ranging from major interdepartmental and interdisciplinary projects, such as the Cold Lake Hydrology Study, to the organization of small internal workshops and the publication of monographs. Twenty-two research projects were contracted to private consulting firms and 28 contracts were provided to universities, while the remainder were with government agencies such as the Alberta Research Council or were service contracts related to divisional operations. Fourteen grants were provided for environmental research, including funding for a number of symposia and workshops.

Thirty-one reports on research projects were published by RMD during the year and a number of articles relating to RMD projects appeared in scientific journals. Additionally, researchers submitted interim or progress reports, which are not published, on long-term projects. Staff members published material internally, through other agencies or in conference proceedings or journals.

A large portion of staff time was spent participating in departmental, interdepartmental and interagency committees which coordinate environmental research programs such as the Reclamation Research Technical Advisory Committee (RRTAC) and the Federal/Provincial Long Range Transport of Atmospheric Pollutants (LRTAP) committee. Involvement in these committees has enhanced the effectiveness of the division and its management capabilities and has ensured that the professional staff have maintained an awareness of current environmental research activities in Alberta and elsewhere.

Within the administrative arm of the Research Management Division, an emphasis was placed on improving the accessibility to sound data in order to monitor research projects. Foundations were laid for a computerized information management system which will be implemented in the future. This system will allow for more responsive administration of research in a rapidly changing environment.

Acid Deposition Research Program: The Acid Deposition Research Program was designed to plan and implement research specific to Alberta which would address concisely and succinctly the following program objectives:

- to characterize sensitive environmental ecosystems and develop methodologies to identify and/or predict measurable short- and long-term effects of acidic or acidifying substances on Alberta ecosystems;
- to determine the characteristics and quantities of long-range emissions and those generated locally and to examine their effects on the environment;
- to develop a basis and an approach for preventive strategies and environmental protection; and
- to co-ordinate departmental research on acid deposition with other private and public agencies in Alberta and in western Canada.

In 1983-84, work on acidic and acidifying substances was concentrated on characterizing and quantifying their ecological effects and continued to be a major research activity in the division. Considerable effort was expended to develop a more thorough understanding of the atmosphere-biosphere interface. A newly developed model shows great promise for simulating this relationship.

The emissions of acid forming substances into the atmosphere and their deposition and subsequent impact on the ecosystem are of significant concern. Because the magnitude and intensity of deposition is episodic, the response of vegetation to pollution episodes is dependent upon the relationship and timing of the episode and the physiological development of the receptor. Specific projects have been geared to the accurate and frequent measurements of the episodicity of pollutant concentrations and their interface with physiological, phenological and productivity responses in vegetation species. The data generated will be used to develop a computerized numerical model for integrating chronic air pollutant exposures and tree growth response. The corresponding interface with soil nutrient and microbiological processes is also being investigated.

Regional surveys to sample and chemically analyze event rainfall and the snowpack for total pollutant loadings in the Athabasca Oil Sands region were continued. Wet deposition, however, is only one of two major and equally important mechanisms in the transfer of pollutants from source to receptor. Air pollutants released into the atmosphere are deposited continuously and cumulatively through both dry- and wet-fall processes. Methodologies and instrumention technology for measuring dry deposition were developed and implemented in the field.

In conjunction with the aforementioned studies, research to determine the transport, dispersion and transformation rates of oxides of sulphur and nitrogen emissions was continued. Such research is intended to facilitate the investigation of the medium- to long-range transport of acid-forming emissions from a major emission source in the area.

The Acid Deposition Research Program will provide scientific information for reviewing and evaluating Alberta's air quality standards, will assist in the present and future planning of industrial development and will enable a good understanding of the potential for environmental acidification. The program will thus establish a basis for sound, long-term environmental management through the development of methodologies to identify and/or predict environmental deterioration caused by acid-forming emissions.

Divisional staff have been heavily involved in the development and co-ordination of a major new program in Alberta during 1983-84, the Alberta Goverment/Industry Acid Deposition Research Program (AGIADRP). This important program is sponsored and managed on a 50-50 basis by government and industry and has an estimated budget of $8 million over the next seven years. The planning and co-ordination of the departmental component of the acid deposition research program with the joint Alberta Government/Industry Acid Deposition Research Program was undertaken by RMD staff during the fiscal year.

Environmental Assessment Program: The Environmental Assessment Program was designed to provide a focus for the measurement and evaluation of environmental trends and conditions and for the development of methodologies for environmental evaluation. Results of the research will provide the scientific support for Alberta Environment's regulations and guidelines and will supply input to the management decision-making process.

During the 1983-84 fiscal year, it became evident that the broad scope of this program made it difficult to formulate and implement long-term planning and integration of its allocated research activities. A decision was made to divide this all-encompassing program into three discrete programs: the Water Resources Research Program; the Geosciences Program; and the Air Quality/Climatology Program. Work on the definition and planning of these programs was begun during this fiscal year, with formal program implementation scheduled for 1985-86.

Research activity under the Environmental Assessment Program continued to provide research information dominated in 1983-84 by three major projects. The Co-operative Program in Surface Water Engineering continued to provide research information to the Technical Services Division of Alberta Environment in the areas of fluvial mechanics and river engineering, surface water hydrology, sediment yield studies, ice formation and break-up of streams. A second major project resulted in the completion of a three-dimensional model of the hydrostratigraphy, hydrodynamics and hydrochemistry of the Cold Lake Oil Sands area. The model was also successfully tested using actual data. The third project, a com-

prehensive study of the stability of Turtle Mountain, produced milestone achievements in two of its components: the aerial photogrammetric network was successfully tested, and the fourth and final phase of the monitoring of the South Peak was completed. The results from these studies, and from other ongoing studies on electronic distance monitoring, seismic monitoring of the old Frank mine workings and the collection of year-round climatological data, will provide an assessment of the current status and future monitoring requirements of the mountain's stability.

A new project was initiated in 1983-84 to develop a model to assess snowmelt infiltration into frozen prairie soils. The model will enable forecasting of soil moisture conditions of these soils in early spring, so that farmers will be able to assess the crop growth potential for the growing season. Also, the results will be useful for forecasting river flows.

The Environmental Assessment Program also included support for graduate research programs in the areas of flow in curved channels, winter oxygen deficits in Alberta lakes and the development of a flatland hydrology simulation model. A grant was also made to contribute to the production of a 13-program water resources research television special.

Environmental Contaminants Program: The Environmental Contaminants Program was restricted to addressing only some specific priority contaminants. The objectives of this program included: the development of a mechanism for identifying and assigning research priorities to contaminants of concern to Alberta, and the development of a mechanism whereby information about the fate and effects of contaminants can be accumulated in order to direct mitigative action.

Major research activities under this program in 1983-84 included an ongoing project seeking to identify the chemical components of the products of in situ oil sands combustion processes and to estimate the potential environmental hazards. Another project involved further testing and refinement of a model developed to improve the prediction of phosphorus content in Alberta lakes.

A graduate student thesis on an improved methodology for calculating nutrient budgets for shallow productive lakes in Alberta was completed in 1983-84. Support was provided for the first year of a two-year graduate program to investigate the temporal variation of stream phosphorus loading and partitioning.

A project was initiated for the analysis of chemical and biological aquatic monitoring data in the Athabasca Oil Sands area. Research was also begun on a one-year project on surface water contamination from sanitary landfills.

Reclamation Program: An RMD scientist continued essentially full-time managerial and administrative responsibilities for provincial reclamation research in association with the interdepartmental Reclamation Research Technical Advisory Committee (RRTAC). In 1983, RRTAC committed approximately $1.5 million to a reclamation research program with subprograms in the northeast oil-sands region, in the coal-bearing region of the province's agricultural zone and in the mountains and foothills. RMD scientists contributed to the development of programs and projects in these areas through participation in government-industry program committees.

Reclamation research was co-ordinated within Alberta Environment by the Reclamation Research Co-ordinating Committee, chaired by the Research Management Division. In the province, such research concentrates on: determining methods of rebuilding productive soils (physically, chemically and biologically); identifying changes in the quantity and quality of surface water and groundwater following disturbance and reclamation; developing native plant species for reclamation; controlling erosion; and improving materials-handling operations.

A synthesis of reclamation information relevant to Alberta from over 1,700 references in the international reclamation literature was written and will be published in May, 1984.

Approximately 600 references have been collected for inclusion in the second edition of the publication ***Land Surface Reclamation: An International Bibliography***. The division's collection of 3,000 reclamation publications (books, articles and proceedings) was transferred to the departmental library to allow wider access to the material.

An inventory of peat analyses methods from international research institutes has been written and will be available in the fall of 1984. This inventory will be used by the International Peat Society to help develop standard international methodology.

The senior program manager has occupied the position of President of the Canadian Land Reclamation Association (CLRA). In addition, an RMD scientist was elected Secretary-Treasurer of the Alberta Chapter of the CLRA. The senior program manager and an RMD scientist edit the quarterly ***CLRA Newsletter***.

Reports on reclamation projects are published through RRTAC rather than by RMD.

Socio-Economic (Environmental Information) Program: This program, which falls into the domain of the division's Human Sciences Group, includes socio-economic analysis of environmental concerns and research into public participation in environmental issues, as well as research evolving from those components of RMD programs having potential for human concern. In addition, members of this team act in an advisory capacity on such matters as human health and public perception and communication of environmental problems. They provide a co-ordinative function in the department and meet with other government agencies.

During the fiscal year, the focus on public perceptions of environmental issues was continued. Data from the 1983 Edmonton area study of the opinions of the city's residents concerning environmental problems, conducted by the Population Research Laboratory of the University of Alberta, were analyzed and a report was placed on open file.

Following intense research and development during 1982, Phase I of a project concerning the effects of plant closures was successfully completed and publication of a report is pending.

The ***Population Turnover in Fort McMurray: Phase I*** study was completed in 1982. A questionnaire identifying why people moved from resource towns was designed and pretested. Funding for Phase II consists of implementation of the questionnaire to former residents of Fort McMurray.

Background documentation and initial project rationales were developed for research into the origins of public attitudes toward the environment. A series of studies designed to investigate the content of communication about environmental matters, with specific reference to the degree and direction of interactions between information programs and the public, will be initiated in the future.

Waste Management Program: The Waste Management Research Program was structured as two separate, although interdependent, research areas reflecting Alberta Environment's mandate for managing waste. These areas or subprograms were social policy research and technology research.

During the 1983-84 fiscal year, waste management research activities were concentrated on the technology research subprogram dealing with the solution of problems in engineering design and facility operation. The primary focus was on the assessment of existing technology, development of new technology and the development of analysis methodology for water and wastewater treatment systems.

The assessment of the effects of chemical coagulants on specific aspects of existing wastewater treatment technologies was addressed by two component studies of a larger project initiated in 1982-83. The first study dealt with possibile impacts of phosphorus removal technology on the performance of anaerobic sludge diges-

tion. The second study sought to determine the effect of chemical (alum) coagulation on micro-organism removal in a sewage lagoon prior to spring discharge.

The third study of the project dealt with the feasibility of using the existing water treatment technologies of chemical coagulation and rapid sand filtration for the removal of Giardia cyst-size particles. Complementary to this study was a project for the development of methodologies to detect Giardia cysts in water supplies.

Support was also provided in 1983-84 for the first year of a three-year graduate student project to investigate the feasibility of using ozone in the treatment of domestic water at the Glenmore Water Treatment Facility.

WATER RESOURCES MANAGEMENT SERVICES

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Assistant Deputy Minister

R. K. Deeprose, P.Eng.
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Technical Services Division

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A. R. Strome, P.Eng.
Director
Water Resources Administration Division

Carl Primus
Director
Planning Division

F. G. Primus
Director
Operation and Maintenance Division

The Water Resources Management Services has the responsibility for overall management and regulation of the province's water resources.

The objectives of the service are to ensure that the multi-purpose water needs of Albertans are met, to solve water-related problems and to provide associated engineering services as required by the department.

Policies and programs to meet these objectives are implemented collectively by the five divisions of the service. This is done by providing planning, engineering services and funding for the implementation of water development and control projects; administering and enforcing the Water Resources Act; operating and maintaining water resources projects; and gathering, compiling and analyzing hydrological information essential for an inventory and for effective provincial water management. The ability of the service to effectively manage the water resources of the province has been steadily improved over the last few years by improvement to the hydrometeorological network upon which river and stream flow forecasting depends. The service is in the forefront of technological development in the gathering and transmission of hydrometeorological data from remote mountainous areas of the province where much of the runoff occurs.

One of the major activities of the service is the implementation of the government's Water Management for Irrigation Use Program. This program involves the rehabilitation of irrigation headworks and canal systems and the development of water supplies for irrigation, industry and other uses. The objective is to maintain a secure and continuous supply of water to irrigation districts and for all other uses.

Other major activities include: the implementation of a flood protection and water management plan for the Paddle River Basin; the development of a water resources management plan to service multi-purpose uses of water in the Cold Lake - Beaver River Basin; implementation of a long-term water resources development scheme for the Vermilion River Basin; and development of an assured supply of good quality water in the Oldman River Basin and implementation of a flow regulation reservoir on the Red Deer River (Dickson Dam), together with erosion and flood control works and development of a project to stabilize the water level of Lesser Slave Lake. The concept of river basin planning is a high priority.

The service is responsible for interprovincial and interjurisdictional matters related to the management of water resources and is responsible for implementing federal-provincial water agreements.

The Assistant Deputy Minister served as chairman of the Dickson Dam and Paddle River Dam Review boards, which were appointed to review and advise the department on all technical aspects of the projects.

The Assistant Deputy Minister served as the representative of the Government of Alberta on the Prairie Provinces Water Board and the Mackenzie River Basin Committee and as the representative of Alberta Environment on the Alberta Water Resources Commission.

Prairie Provinces Water Board (PPWB)

The Prairie Provinces Water Board, established in 1948 by a federal-provincial agreement and reconstituted in 1969, consists of representatives from the governments of Canada, Alberta, Saskatchewan and Manitoba. Its function is to administer the 1969 Master Agreement on Apportionment, which applies to eastward flowing watercourses, and make recommendations on interjurisdictional water matters related to its term of reference or referred to the board.

Apportionment Administration: Agreement was reached on the apportionment of the waters of the Battle and Lodge Creek basins, which are shared between Alberta and Saskatchewan. An amendment to the Master Agreement was finalized. The board agreed that the Beaver River interim requirements for water quality will remain in effect until the newly proposed approach for establishing water quality requirements at interprovincial boundaries has been tested and approved. During this period, the board directed the Committee on Groundwater to consider the feasibility of hydrologic mapping of interprovincial aquifers to delineate areas where interprovincial groundwater may become a problem. The issue of westward flowing tributaries of eastward flowing streams remains unresolved. Because of the importance of this issue to Alberta in the Cold Lake area, this province is actively pursuing a favorable resolution of this issue.

The measured volume of water flow, the computed volume of natural flow and the percentage of natural flow represented by the measured flow which passed from Alberta into Saskatchewan in the North and South Saskatchewan rivers during the 1983 calendar year as follows:

Flow in Acre Feet

	Measured	Natural	%
North Sask. R.	4,640,000	4,512,000	103
South Sask. R.	3,340,640	4,847,040	69

Hydrology: The board's Committee on Hydrology agreed that updating natural flow data for the Alberta portion of the South Saskatchewan River Basin should be done on a regular basis. A study to evaluate reservoir evaporation for the St. Mary, Waterton and Dickson reservoirs was initiated. The study will provide recommendations on the methods to be used to compute reservoir evaporation for natural flow computation purposes.

Water Quality: The Committee on Water Quality developed a new two-level approach for establishing water quality requirements at interprovincial boundaries. The detailed seasonal water quality statistics of the Beaver River at the Alberta-Saskatchewan boundary were reviewed, and recommendations for the site-specific Water Quality Requirements for this river were submitted to the board. As well, the detailed statistical data results needed to establish Water Quality Requirements in the South Saskatchewan River at the Alberta-Saskatchewan boundary were reviewed. A P.P.W.B. Water Quality Contingency Plan was developed and approved to facilitate the transfer of water quality information regarding spills and unusual water quality conditions to member agencies.

Groundwater: The board's Committee on Groundwater reviewed information compiled to assess the impact of subsurface fluid disposal on aquifer systems in northeastern Alberta and northwestern Saskatchewan and agreed that the wastewater disposal into the McMurray Formation, as proposed, would have no measurable impact in Saskatchewan.

Mackenzie River Basin

The main issues dealt with by the Mackenzie River Basin Committee in 1983 included working towards securing a transboundary water management agreement, particularly for the headwaters of the basin, and implementing an integrated hydrometric network of hydrometric, snow, meteorologic, sediment and water quality stations for the Mackenzie basin. Additionally, continued attempts were made to carry out a study of spring break up on the Liaird River. These latter two issues were raised by recommendations two and five in the Mackenzie basin studies report of February 1982.

A draft general agreement and two detailed implementation agreements were prepared and reviewed by the various member agencies.

TECHNICAL SERVICES DIVISION

The Technical Services Division is responsible for providing the department with all necessary expertise in river flow forecasting, river engineering, surface water hydrology and surveying. It co-ordinates the department's operations in the physical assessment of the occurrence, control and effect of surface water in relation to natural phenomena, man-made works and proposed projects.

River Forecast Centre

The River Forecast Centre provides river forecasts for flood warning and optimum management of the major water resources of the province. The Centre monitors streamflow conditions and advises on measures to be taken to meet the terms of the Master Agreement on Apportionment.

Streamflow Monitoring and Forecasting: The Centre monitors the water level on a large number of rivers and lakes throughout the province for a variety of reasons.

River water levels are used to determine the rate of streamflow. Streamflow data is essential to flood forecasting operations as well as to day-to-day water management operations. A number of communities require streamflow data to determine the rate at which they can discharge sewage effluent into a river. Construction firms working in the floodplain of a river require advance warning of expected changes in the river level to protect their equipment.

The Centre is able to report on current river conditions, as well as expected conditions a few days into the future for most large streams in Alberta. Weekly reports of streamflow conditions in Alberta are prepared for a variety of interested agencies, both in government and in the private sector. An automatic telephone answering device is used to provide public information on current river conditions, primarily to canoe clubs and other recreational interests. Flood situations resulting from rainfall or melting snow are analyzed as they occur, and warning of expected river levels is disseminated to a variety of other agencies responsible for flood damage prevention and flood event analysis. Several such situations occurred during the summer of 1983, most notably in the Lesser Slave Lake area.

Lake water levels are used to determine the amount of water in storage in irrigation or hydroelectric power reservoirs. Water storage data is of interest to a variety of water management agencies.

Water Supply Forecasting: The Centre issues the "Water Supply Outlook and Snow Survey Bulletin" in co-operation with the Survey Branch on a monthly basis from March to August, with a summary report issued in November. The water supply for southern and central Alberta was generally below average for the summer of 1983. Copies of the 1983 Water Supply Summary are available from the Centre.

Climatic Network and Data Acquisition: The Centre continues to co-operate with the Water Survey Section of the Survey Branch on the installation and maintenance of the Alberta Environment Real-time Hydrometeorological Network. Data from the network has been used extensively and has proven to be extremely valuable for flood and water-supply forecasting. Planning continues for the gradual expansion of this network into other areas where the present data base is inadequate to support satisfactory river forecasting service.

Staff of the Centre also routinely participate in snow surveys conducted in the late winter and spring of each year. Data from these surveys are used for spring snowmelt runoff forecasting and summer water-supply forecasting.

Special Projects: The Centre worked on development of forecasting procedures for two special areas of concern during the past year:

— spring break-up near the Town of Peace River (in co-operation with the River Engineering Branch); and

— water supply for the Lodge and Middle Creek watersheds in southeastern Alberta (both creeks come under the Master

Agreement on Apportionment). Preliminary procedures have been developed for both situations, but further refinement is necessary.

Development work on the Weather Radar for River Forecasting Project was completed in March, 1984. This system, developed and maintained by the Atmospheric Sciences Department of the Alberta Research Council, will provide rainfall data for the entire area within a 150 kilometre radius of Penhold (near the City of Red Deer) and will be in routine operation during the summer of 1984.

River Engineering Branch

The River Engineering Branch provides expertise in the area of river morphology and dynamics. The general areas handled by this Branch are:

- analysis of river processes;
- river erosion protection and river training;
- flooding analysis for land development around rivers and lakes;
- preparation of flood risk maps;
- design and analysis for flood reduction schemes;
- ice-jam monitoring and control at freeze-up and breakup;
- evaluation of the impact of water management works (dams, weirs, etc.) on the existing regime of the rivers;
- general assessments: river engineering input to permitting of gravel mining, pipeline crossings, bridges, culverts and intake and outlet work; and
- river data (flood surveys, etc.) collection.

Erosion Protection and River Training: Problem evaluation and preliminary design reports were prepared for 22 major projects. Some of the significant projects handled were:

- Squaw Coulee diversion;
- Shoal Creek channelization;
- Mountainview intake — river training level 1 and 2;
- Battle River/Pipestone Creek low flow/ice study;
- aggradation Dickson Dam reservoir;
- Paddle Prairie flood control; and
- Wapiti Ski Hill erosion.

In all, 46 major and minor projects related to river erosion, stabilization and sedimentation were completed.

Flooding Analysis: Sixty-four flooding assessments were done during the year and 74 subdivision applications were assessed for flood risk as an input to various agencies (Planning Commission, etc.).

Flood Risk Mapping: Flood risk maps are prepared to show the flood-prone areas so that future land development can take the risk into account, resulting in reduced loss of human life and property. Major reports were completed for:

- Bow and Elbow rivers and Nose Creek through the City of Calgary;
- Elbow River at Bragg Creek (revised);
- Waskasoo Creek at Red Deer (revised); and
- Bow River at Cochrane — Stage 1.

Work is at different stages of completion on the following flood risk mapping projects:

- South Saskatchewan at Medicine Hat;
- Red Deer River through Drumheller Valley;
- Westcastle Ski Development;
- Bow River at Cochrane — Stage 2;
- Sheep River at Okotoks (revisions); and
- Blackmud Creek.

Flood Protection Studies: Major work was done on studies for the following areas:

- Elbow River through Calgary; and
- Athabasca/Clearwater River at Fort McMurray.

Ice Jam Monitoring and Control: Both breakup and freeze-up ice fronts were monitored at the Town of Peace River and at Fort McMurray. Extensive work was done with the Alberta/B.C. Hydro Joint Task Force for the Peace River to set up the freeze-up level of the Peace River at Peace River.

Ice monitoring was done on the North Saskatchewan River at Rocky Mountain House and on the Red Deer River downstream from the Dickson Dam.

Assessment for Permits and Licences: Nineteen bridge/culvert crossings, 100 sand and gravel, 93 pipeline crossings and 18 other permits and licences were reviewed during the year.

Hydrology Branch

The Hydrology Branch is a specialized service group of 19 staff members responsible for providing hydrological engineering analyses of the surface water resources of the province. This responsibility includes the determination of annual and seasonal volumes of streamflow, the magnitude and frequency of extreme events such as floods and droughts and the provision of information and analyses for water management projects such as river basin planning, reservoir design and lake stabilization. The branch also assesses both the natural and man-altered environmental characteristics affecting runoff. For example, comprehensive research is being carried out to demonstrate the water yield changes through forest management.

Several major studies, which required a significant commitment of manpower and resources, represented the more important technical accomplishments. These major studies included:

- documentation of all major floods recorded in the Oldman River Basin;
- preliminary water supply studies for Alkali Creek, Berry Creek, Bullpound Creek, Kennedy Creek and Michichi Creek, as well as the upper portion of Sounding Creek in the Eyehill Creek Basin;
- water balance study on Cardinal Lake near Grimshaw, in the Peace River Basin;
- Beaver River Basin natural flow report, update to 1982;
- regional flood analyses of the following river basins: Rosebud River, Blindman River, Medicine River, Raven River, James River, Little Red Deer River and the Peace River;
- analysis of floods for floodplain studies on the Waskasoo Creek and Westcastle River; and
- South Saskatchewan River Basin natural flow report, update to 1982.

The Hydrology Branch has also been investigating the effects of land-use changes in the Spring Creek study basin. The objective of the Spring Creek project is to evaluate the impact of large-scale deforestation on the hydrologic cycle in a boreal forest environment.

A new technique for positive discrimination between storage-related and man-caused changes of runoff characteristics has been developed and tested using the Spring Creek data. This new technique mathematically describes, at any given time, the relationship between saturation conditions of the basin and the corresponding runoff contribution storage space (drainage area). This technique is called the Storage-Effective Drainage (SED) Model.

During the past year, the branch also answered some 280 requests of a minor nature in the form of hydrological analyses or technical reviews of reports for other groups in the department, such as Water Rights Branch and Planning Division. Figure 1 illustrates the number of analyses carried out over the previous years as compared to this fiscal year.

Survey Branch

The Survey Branch provides land and water surveys to the department. Data collected is used for the investigation, implementation and management of departmental projects, for the management of the province's water resources and to contribute to the data base of land survey and hydrometeorological information. The branch carries out its responsibilities through two sections, the Land Survey Section and the Water Survey Section. The branch also operates the Technical Services Division Records Centre, which provides land survey and hydrometeorological data and related information to users throughout the department, to other government departments, to consultants and to the general public.

The Survey Branch is represented on a number of departmental, interdepartmental and intergovernmental committees:

- Irrigation Implementation Committee;
- Paddle River Implementation Committee;
- Interdepartmental Committee on Surveying and Mapping;
- Co-ordinating Committee for the Federal-Provincial Hydrometric Cost-sharing Agreement; and
- Co-ordinating Committee for the Federal-Provincial Cost-Sharing Agreement for Meteorological Programs and Stations.

Land Survey: This section provides engineering and control surveys from five regional offices. The section also arranges for legal surveys, aerial photography and mapping which are provided by the private sector. Some engineering and control surveys are also provided by consultants. The section hires and supervises consultants.

In 1983-84, there were 473 engineering and control survey projects. Of these, 41 were contracted to private sector survey firms at a cost of $0.93 million. Other contracted services include 26 legal survey projects for a cost of $0.17 million, 16 mapping projects for a cost of $0.17 million and 53 aerial photography projects at a cost of $0.14 million. Contracted services were funded from the branch's operating budget and from funds provided for in other budgets for major departmental projects, including those funded by the Heritage Savings and Trust Fund.

By region, some of the larger projects for which surveys were carried out were:

Peace River	— Lesser Slave Lake Regulation
	— Harold Creek Drainage
	— South Sneddon Erosion Control
Edmonton	— Paddle River Dam
	— Redwater River
	— Shoal Creek
Red Deer	— Sheerness Blowdown Canal
	— Mountain View Regional Water Supply
Calgary	— Little Bow Canal
	— McLean Creek Impoundment
Lethbridge	— Lethbridge Northern Irrigation District Main Canal
	— Travers Reservoir Mapping Control

The number of farm surface drainage surveys increased significantly over 1982, particularly in the Peace River region.

Water Survey: This section provides hydrometeorological data to the department with emphasis on the needs of the other branches of the Technical Services Division. Data is gathered by the field staff within the section and through two federal-provincial cost-sharing agreements.

During 1983, the following data collection stations were operated by section staff:

— Lake level	223 stations
— Recording streamflow or water level	70 stations
— Non-recording streamflow	89 stations
— Snow courses	101 stations
— Snow pillows	15 stations
— Non-recording precipitation	24 stations
— Recording precipitation	43 stations

Under the terms of the Federal-Provincial Cost-Sharing Agreement for Meteorological Programs and Stations, four recording precipitation stations were installed and 26 stations were operated.

Under the terms of the Federal-Provincial Cost-Sharing Agreement for Water Quantity Stations, 22 new stations were constructed and 466 stations were operated by Water Resources Branch, Environment Canada.

Expansion of the real-time hydrometeorological network continued during 1983-84; an additional six satellite data-collection platforms were installed, bringing the total network to 54. Data-gathering activities continued in Peace Athabasca Delta and in the Spring Creek research basin.

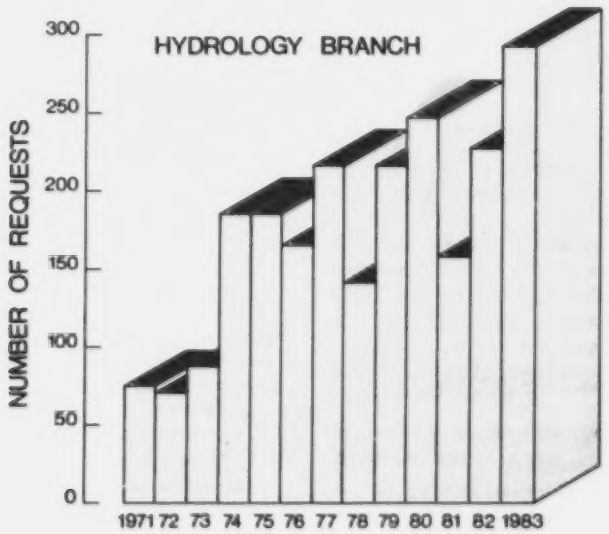


FIG. 4

DESIGN AND CONSTRUCTION DIVISION

The Design and Construction Division is responsible for implementing surface water development and control projects throughout the province. Major categories of these projects include multi-purpose water supply, storage and distribution, major irrigation works rehabilitation, drainage, flood and erosion control and lake level stabilization.

The implementation of surface water development projects involves field investigations and the preparation of detailed plans in geotechnical, hydraulic and structural specialties. It also involves project management, contract administration, construction supervision and quality control. The division operates a materials testing laboratory and provides drafting services.

The divisions may be directly involved in all phases of water development projects or division staff may provide administrative and fiscal control only on major projects, such as the St. Mary Main Canal, which are designed and inspected by private sector consultants. Typical water development projects are described in each of the branch reports.

Major capital projects administered by the design and Construction Division include the Paddle River Flood Control Project, the Lesser Slave Lake Stabilization Project and projects of the Irrigation Headworks and Main Irrigation Systems Improvement Program.

A newly formed Land Services Section provides the department with land related services and co-ordination with Alberta Pubic Works, Supply and Services.

Construction Branch

The branch provides construction management and contract administration services for construction of department water management projects.

During the year, it provided such services for 59 projects with expenditures exceeding $31 million for the fiscal year.

Lethbridge Northern Main Headworks System Rehabilitation: Located near Fort MacLeod in southern Alberta, the project involves the improvement of the main canal system to increase its capacity, to prevent erosion to the canal banks and to prevent seepage from the canal. During the year, the branch administered eight tendered contracts at a fiscal year expenditure of $10.5 million. Five of these contracts involved work on the main canal while the other three involved work on the diversion weir located on the Oldman River and the construction of a new flume located on Willow Creek.

Sheerness Blowdown Canal: Located southeast of the Town of Hanna in southern Alberta, the project involves the construction of a concrete lined irrigation canal leading from the cooling ponds of the Sheerness Power Generation Plant to the Carolside Reservoir. A tendered contract valued at $4.9 million was awarded during the summer of 1983, with completion anticipated for June, 1984.

Mountain View Regional Water Supply Intake-Bank Stabilization Project: Located east of the Town of Innisfail, the project involved the stabilization of the bank of the Red Deer River to ensure a continuous flow of water to the intake structure for the Mountain View Regional Water System. A tendered contract involving expenditures of $0.8 million was awarded during the winter of 1984 for rebuilding the bank and protecting it from erosion by the placement of armor riprap.

Lesser Slave Lake Regulation: Located immediately north of the Town of Slave Lake, the project involved the construction of a control weir on the Lesser Slave River, to control the low levels of Lesser Slave Lake. A tendered contract was awarded during the summer of 1983 involving the installation of a sheet steel piling control weir with fishway, with a fiscal year expenditure of approximately $1.0 million.

Paddle River Dam: The branch administered three tendered contracts including the second stage of the main embankment, the concrete spillway and the installation of the control gates at a fiscal year expenditure of $9.96 million, as well as carrying out the construction supervision of hourly work including the construction of the trout pond and gas well dyke.

Design Branch

The Design Branch is responsible for the hydraulic and structural designs for the implementation of multi-purpose water related projects undertaken by the Water Resources Management Services. This includes the preparation of preliminary design reports and detailed project designs complete with construction contract documents and cost estimates. Project management is provided for major projects that are generally hydraulic and structural in nature.

On-going project management is provided for the rehabilitation and expansion of the Lethbridge Northern Main Headworks System.

Hydraulic and structural engineering services in the form of technical reviews and support are provided to other divisions and departments.

The branch also provides a diversified drafting service to accommodate the drafting requirements of the division and the department.

Hydraulic and Structural Design Section: The Hydraulic and Structural Section, in conjunction with the Geotechnical Design Section, prepared seven preliminary engineering design reports and 26 detailed project designs with an estimated construction value of $1.6 million and $24.7 million respectively.

The types of projects represented by the total figures quoted, for preliminary and detailed design estimates are found in Table 11.

Table 11

Project Types and Estimates

Project Type	Preliminary Design Estimate	Detailed Design Estimate
Drainage and Flood Control	$ 965,000	$ 1,040,000
Erosion Control	—	1,220,000
Irrigation	114,000	21,380,000
Water Supply	500,000	—
Lake Stabilization	—	100,000
Multi-purpose	37,000	983,000
Total	$1,616,000	$24,723,000

While not all projects are described in detail in this report, those where project management is provided by the branch staff or have special significance are cited.

Lethbridge Northern Main Headworks System: This project consists of rehabilitation and expansion of approximately 80 kilometres of irrigation main canal and associated structures, improvements to the Diversion Headworks and raising of Keho Lake. This multi-phased reconstruction program, consisting of more than 25 separate contracts, is scheduled for completion by 1989.

The work completed to date includes the construction of Rocky Coulee Embankment, Main Diversion Headworks rehabilitation, Oldman River Flume replacement and three main canal reaches (total length, 14.6 kilometres) at a total construction expenditure of approximately $32 million. All the works within the Peigan Reserve are complete, except for the demolition and removal of the existing Oldman River Flume.

The construction of Willow Creek Flume replacement structure and two main canal reaches (total length, 17 kilometres) is in progress. Completion of these works is scheduled for the spring of 1985. The total tendered value of these contracts is approximately $16 million.

Preparation of contract documents is nearing completion of two canal reaches (total length, 13.5 kilometres), Keho Lake Dyking and outlet works. Detailed designs have been initiated for an additional 11 kilometre reach of main canal.

Fishways: In keeping with the objective of managing Alberta's water resources for multi-purpose benefits, numerous water controls structures have been constructed throughout the province. In recent years, most water control structures have incorporated fishways to allow for natural fish migrations. A practical research program to determine the most effective type of fishway was carried out in the laboratory, and there have been several field installations within the past year.

Projects where fishways have recently been installed include Fawcett Lake, Beaverlodge River, Lesser Slave Lake and the LNID Headworks on the Oldman River. Several different types of fish ladders have been installed at the above locations and these will be monitored to determine their effectiveness. This developmental work is being carried out in close co-operation with the Fish and Wildlife Division of Alberta Energy and Natural Resources.

A field evaluation program of the Denil fishway was initiated in March, 1984, at the Lesser Salve Lake control structure. At this site, two identical Denil fishways are deployed in conjunction with a vertical slot fishway to permit field assessment of relative performance.

Drafting Pool: The Drafting Pool, with regional offices located in Peace River, Edmonton, Calgary and Lethbridge, provides the department with a broad scope of general drafting, structural, topographical and hydrographical survey drafting services.

The preparation of preliminary and detailed engineering drawings for the construction of the Paddle River Dam Project and the rehabilitation of the LNID main headworks system constituted the main workload of the structural section.

Other drafting services for a variety of divisions included topographical and hydrographical survey data plotting and aerial photo-mosaic construction. Maps, graphs, charts and pictorials were also prepared for inclusion in reports or used for presentations and displays.

The photo laboratory commenced operation and was very well used in support of the drafting services.

Geotechnical Branch

The Geotechnical Branch is responsible for air-photo interpretation, geological engineering and geotechnical investigation assessments and designs on projects undertaken by the division. Contract documents and cost estimates are produced and project management is undertaken for projects that are largely geotechnical in nature. Engineering services, consulting services and technical reviews are provided to other divisions, departments and agencies within the government.

Project management was provided by the Geotechnical Branch for the Lesser Slave Lake Regulation and the Forty Mile Coulee Reservoir projects. The weir and last cutoff were constructed on the Lesser Slave Lake Regulation Project. This project is now complete except for some clean up. Investigations were completed and the designs finalized for the Forty Mile Coulee Reservoir Project. The Forty Mile Coulee Syphon has been tendered and construction is underway.

Geotechnical Design Section: The Geotechnical Design Section is responsible for producing preliminary and final geotechnical designs for the water resources projects initiated by the department.

During the past year, the section completed a total of seven preliminary and 23 final geotechnical designs for a variety of projects such as the construction of new and the rehabilitation of existing irrigation headworks systems, the construction of dams for creating recreation reservoirs and the construction of control structures for rectifying flood and erosion related problems. One of the major projects initiated during the past year was the Cold Lake-Beaver River Water Management Plan. The major geotechnical component of this project consists of the preliminary design of a 30 metre-high earthfill dam on the Sand River. Another major activity performed by the section during the past year consisted of completing the geotechnical designs for several components required for the rehabilitation of the LNID Irrigation Headworks System. This year, the final designs for approximately 16 kilometres canal expansion and rehabilitation, the Monarch Branch Headworks Check Structure and the Willow Creek flume, were completed.

In addition to providing the designs for projects, the section also performed 33 geotechnical reviews for other divisions within the department. The types of review performed varied from evaluating construction drawings for proposed sewage lagoon and mine tailing disposal sites to assessing river bank stability studies and subdivision development proposals.

Geotechnical Services Section: The Geotechnical Services Section is responsible for the geological engineering, site investigations, material testing and geotechnical consulting contract management for projects undertaken by the branch.

Geological engineering including air photo interpretation has been undertaken for most of the smaller and all of the larger sized projects for which the branch is responsible. A detailed geological report is being prepared for the Sand River dam site.

Investigation: The investigation unit conducts geotechnical investigations including site reconnaissance, drilling, field testing and instrument installation for monitoring of water resource projects. This unit also maintains an inventory file of granular materials for department projects throughout the province.

During the past year, the unit conducted geotechnical investigations on 30 projects. Testing and instrument installations were done on an additional five projects for the Geotechnical Services Section, other branches and consultants performing studies for the department.

Granular searches were completed for eight projects.

Materials Testing Laboratory: The Materials Testing Laboratory provides testing services in the laboratory for soil and concrete design and in the field for quality control inspection services during construction.

During the past year, the laboratory provided testing for 38 projects and quality control inspection on five construction projects. The larger portion of field quality control time of the main laboratory staff was as supplementary staff at the field laboratories at the Paddle River Dam Project and the Lethbridge Northern Main Canal Rehabilitation Project.

Office of the Director

The Director of Design and Construction served as a member of Irrigation Council, Chairman of the Irrigation Implementation Committee, Chairman of the Paddle River Implementation Committee and Co-ordinator with Peigan Band Council for implementation of the LNID Headworks Rehabilitation Project. The director's office maintains a contracts administration unit and administration and fiscal control of the Headworks and Main Irrigation Systems Programm financed by the Alberta Heritage Savings Trust Fund.

WATER RESOURCES ADMINISTRATION DIVISION

The Water Resources Administration Division is responsible for the administration and enforcement of the Water Resources Act and Regulations and of the Drainage Districts Act and for financial assistance to local governments under Position Paper No. 5 (Cost-Sharing for Water Resource Management Projects). These responsibilities are carried out by five branches: the Surface Water Rights Branch, Ground Water Rights Branch, Dam Safety Branch, Regional Services Branch and the Administrative Support Branch.

Water Rights

The Surface Water Rights Branch and the Ground Water Rights Branch are responsible for processing applications under the Water Resources Act for licences to divert and use surface water and ground water. Terms and conditions for the licences are prepared through liaison with other agencies and input from private individuals or groups. Files and plans are maintained for all projects and the quantity of water consumed is monitored by field inspections and mailed water-use returns.

Surface Water Rights Branch

The Surface Water Rights Branch progress report again indicates a considerable increase in activity by the Surface Water Rights Branch staff and a sharp drop in the number of outstanding applications in spite of an increase in the number of new applications received. This report contains an additional column for re-issued Interim Licences which represents a good portion of the workload with a fair increase in the number issued over the previous year (see Tables 12 and 13).

Major input from the water rights area was required for energy projects such as Esso Resources Canada Ltd. at Cold Lake, Gregg River Resources Inc. and Cardinal River Coal Inc. at Luscar and Union Oil Ltd. at Hinton. Water rights staff also provided further input into the water supply and demand studies in the Cold Lake-Beaver River area and into the subsequent development of water-use criteria for the area.

Due to licensing concerns, a study was done for the West Branch of Michichi Creek. The results of the study were used to develop a Water Administration Criteria for licensing projects in the basin. Also, effective November 25, 1983, a moratorium was placed on the processing of further licence applications on the main stems of the Little Bow and Mosquito Creeks. Exempted from the moratorium are small domestic projects, necessary municipal projects and 13 irrigation projects. The moritorium will remain in effect until such time as the water-supply study of the Little Bow River Basin has been completed.

Hydro-Electric Section: The Hydro-Electric Section is responsible for the administration of the Provincial Water Power Regulations under the Water Resources Act.

During the 1983-84 year, TransAlta Utilities Corporation completed a number of major construction and maintenance projects. This work included: the upper portion of the core in the Ghost Dam was replaced and the concrete piers for the emergency spillway were restored; a new dyke for the Spray Intake Canal was constructed; the upper portion of the core in Whitemans Dam was replaced; renovations to the Spray Canal were completed; the spillway for Kananaskis Dam was modified and sluice gates were installed; and the rock escarpment above the Brazeau Plant was stabilized by the installation of toe drains and heavy gauge wire mesh was attached to the anchors imbedded in the rock face.

Field inspections were conducted for the purpose of monitoring progress on construction and maintenance projects and to identify and assess all proposals and activities associated with hydro-power lands, in order to ensure that these activities do not interfere with the hydro-power operations or endanger the public. During the winter,

Table 12

Surface Water Rights Progress Report

	Dom.	Mun.	Irgtn.	Agr.	Ind.	Water Power	Other	Storage	Natural State	Dvrsn.	Total 83-84	Total 82-83
Application Received	225	10	91	2	13	0	9	34	0	121	505	359
Interim Licences Issued	243	22	85	1	24	0	12	43	0	117	547	510
Interim Licences Re-issued	586	26	154	0	39	0	8	223	0	28	1,064	745
Licences Issued	529	33	137	0	63	0	14	212	0	113	1,101	798
Licences Re-issued	256	13	65	0	9	0	0	24	0	6	373	300
Permits Issued	0	33	0	0	320	0	149	0	0	0	502	480
Transfers	345	1	74	0	5	0	0	2	0	15	442	477
Cancellations	124	5	126	1	23	0	25	26	0	34	363	416

Table 13

Surface Water Rights In Good Standing As Of March 31, 1984

	Dom.	Mun.	Irgtn.	Agr.	Ind.	Water Power	Other	Storage	Natural State	Dvrsn.	Total 83-84	Total 82-83
Applications	47	10	185	2	8	0	26	49	0	132	459	589
Interim Licences	275	33	388	4	40	1	79	133	0	570	1,523	2,281
Licences	5,613	239	1,891	4	293	8	48	342	0	467	8,905	7,891
Net Totals	5,935	282	2,464	10	341	9	153	524	0	1,169	10,887	10,761

Table 14

Ground Water Rights Progress Report

	Dom.	Mun.	Irgtn.	Agr.	Ind.	Other	Storage	Dvrsn.	Total 83-84	Total 82-83	Total 81-82
Exploration Permits Issued	9	22	4	10	35	10	0	6	96	80	121
Applications Received	9	38	1	20	78	13	2	11	272	153	93
Interim Licences Issued	15	22	1	11	134	16	1	3	203	137	146
Interim Licences Re-issued	1	41	0	22	20	1	0	0	85	83	45
Licences Issued	11	65	3	40	154	3	1	2	279	243	95
Licences Re-issued	1	0	0	7	0	0	0	0	8	0	0
Transfers	1	9	1	8	46	1	0	0	66	21	18
Cancellations	8	21	0	2	13	0	0	9	53	31	4

Table 15

Ground Water Rights In Good Standing As Of March 31, 1984

	Dom.	Mun.	Irgtn.	Agr.	Ind.	Other	Dvrsn.	Storage	Total 83-84	Total 82-83	Total 81-82
Applications	6	23	3	1	181	2	10	0	226	115	103
Interim Licences	65	434	8	61	157	36	10	8	779	888	996
Licences	38	239	18	551	285	3	6	2	1,142	880	631
Net Totals	109	696	29	613	623	41	26	10	2,147	1,883	1,730

the North Saskatchewan River and Bow River were monitored to observe ice phenomenon and flow conditions.

Net hydro-electric generation for the past seven years was:

Year	Megawatt-hours
1977	1,518,000
1978	1,824,000
1979	1,408,000
1980	1,692,000
1981	2,027,000
1982	1,584,000
1983	1,473,000

Ground Water Rights Branch

The Ground Water Rights Branch progress report shows a considerable increase in the level of activity for 1983-84 with an increase of about 78 per cent in the number of applications received, 20 per cent in the number of exploration permits issued and 48 per cent in the number of interim licences issued. Some of the increase can be attributed to concentration of effort and manpower in reducing the number of unauthorized industrial water source wells (see Tables 14 and 15).

There were 151 field inspections conducted during the year. Of these, 122 were inspections carried out under Section 33 of the Water Resources Act and 29 were either complaint investigations or inspections made to obtain information regarding applications for exploration permits or licences.

Regional Services Branch

Regional offices are located in Peace River, Edmonton, Red Deer, Calgary and Lethbridge. Staff from these offices inspect a variety of water-related problems. Requests for inspections are received from the general public and local and provincial departments.

Regional staff are involved with field inspections, the processing of permit and licence applications for non-consumptive water uses and meetings with local authorities, the public and other agencies.

The regional offices administer and manage a $6.78 million program which provides for cost-sharing with local governments for water management projects. Cost-sharing is on a 75/25 per cent basis with the province providing a grant of 75 per cent of the eligible cost of an approved project. Projects which include flow regulation, flood and erosion control, water conservation, lake stabilization and water management on agricultural land are eligible for grants under the program.

Under the Farm Water Management Program, the regional offices provide technical assistance to landowners who wish to implement a water management project. This assistance includes survey and design services required for the project to be constructed.

The regional offices also provide support to the department's Planning Division for studies on major river basins.

Staff in the regional offices initiate enforcement action when a violation of the Water Resources Act is discovered.

Table 16 summarizes regional activities for the year.

Peace River Region: Spring runoff was uneventful for a fifth year. There was no flood alert for the Town of Peace River. There was a lack of rainfall in spring; however, the number of inspections requested increased from the previous years.

There were two heavy rainstorms during the summer season. The most severe storm, occurring in late June, resulted in high flows for the Lesser Slave, Swan and East and West Prairie Rivers. The second storm encompassed the Valleyview - Slave Lake region. Precipitation for May through September was 144 per cent of normal.

The Peace River Region received 304 requests for field inspections on water control and water management problems. The region conducted 275 inspections and processed 242 technical reports. The Farm Surface Water Management Program accounted for 88 of the inspections received; there were 47 inspections relating licensing requirements of the Water Resources Act.

The Peace River Region issued a total of 11 licences for non-consumptive projects. There were 119 permits and 32 letters of authority issued.

During the 1983-84 year, 26 water management projects were commenced or constructed. Of these projects, 14 were funded totally by the province. The remainder of the projects were cost-shared with local authorities.

Edmonton Region: Edmonton Region staff were primarily involved with field inspections and processing of inspection reports, processing of permit and licence applications for non-consumptive water uses, review of engineering reports and meetings with local authorities and the public.

Heavy rainstorms during the latter part of June and the month of July resulted in a large demand for inspection services in the Edmonton Region. Serious flooding problems were experienced in the eastern part of the region, particularly in the vicinity of the towns of Vegreville and Lamont and along the Vermilion River.

The Edmonton Region received 543 requests for field inspections on water control and water management problems. During the 1983-84 year, 528 field inspections were completed. As of March 31, 1984, 73 requests were outstanding and required an inspection.

The Edmonton Region received 50 new licence applications and 212 new permit applications during the 1983-84 year. A total of 48 interim licences, 54 licences and 219 permits were issued. Six licence applications were cancelled. The region also issued 71 letters of authority. As of March 31, 1984, there were 11 outstanding licence applications and nine outstanding permit applications that required processing.

During the 1983-84 fiscal year, a total of 33 projects were funded in the region. Of these projects, five were funded totally by the province. The remainder of the projects were cost-shared with local authorities under the Water Resources Grant Program.

There were 42 new requests under the Farm Surface Water Management Program. Forty surveys and 35 designs were completed during the 1983-84 fiscal year. Construction was undertaken on 12 projects. Twelve interim licences and 12 licences were granted for farm surface water projects.

Consultant funding in the Edmonton Region amounted to $48,500 for inspection services and $30,100 for assistance in the Farm Surface Water Program.

Red Deer Region: Spring runoff was generally below normal during the 1983-84 season and was reflected in fewer inspection requests. This trend continued for the remainder of the season.

The Red Deer Region received 242 requests for field inspections during the fiscal year. Two hundred and forty inspections were completed and processed. As of March 31, 1984, 61 requests were outstanding. Approximately one-fifth of the requests and inspections were for the Water Rights Branch.

Included in the above total are 36 inspection requests under the Farm Surface Water Management Program. Eleven projects were constructed under this program.

The Red Deer Region issued 17 licences for non-consumptive projects. In addition, 120 permits and 61 letters of authority were issued.

During the fiscal year, 13 projects were implemented under the Water Resources Grant Program. Nine projects were under study.

Table 16

Summary of Regional Activities — 1983-84 Fiscal Year

Regional Office	Inspections Remaining From Previous Year	Inspections Requests**	Inspections Completed	Inspections Remaining	Technical Reports Processed	Farm Surface Water Program Requests	FSWP Under Study	Cost Shared Projects Started and/ or Completed
Peace River	45	304	275	74	242	88	57	26
Edmonton	58	543	528	73	528	42	40	33
Red Deer	59	242	240	61	240	36	11	13
Calgary	38	558	531	65	531	5	4	3
Lethbridge	160	640	757	43	757	17	16	7
**Include Inspections for Water Rights Branch								
Total 1983-84	360	2,287	2,331	316	2,298	188	128	82
Total 1982-83	437	1,826	1,962	360	1,916	130	56	65

Table 17

Summary of Records Administration Activities

Year	Files Created	Reports Indexed	Files Retrieved	Plans Filmed	35mm Images Produced	16mm Images Produced	Micro Jackets Produced	Duplicate Working Film Produced
1981-82	491	280	20,267	1,430	2,291	133,362	7,074	13,652
1982-83	550	294	36,987	3,274	7,600	259,997	9,095	72,570
1983-84	867	246	47,147	3,967	8,482	192,927	5,114	33,614
Records Disposition								
1981-82		62 cubic feet						
1982-83		79 cubic feet						
1983-84		84½ cubic feet						

Calgary Region: The mountain snowpacks of the Bow River Basin were normal to slightly below normal in March, 1983. Warm temperatures resulted in early melting and runoff. Precipitation during the months of May and June was below normal. This combination resulted in below normal flows for most of August and September. The Bow River at Calgary produced 80 per cent of its normal May to September flow, the Highwood River 65 per cent and the Elbow River 49 per cent. Hydroelectric power operations and the irrigation districts experienced some difficulties in the latter part of the summer as a result of the low flows. In early August, levels in hydroelectric reservoirs were lowered to provide increased flows for the irrigation districts. The Western Irrigation District was able to meet the demand from irrigators. Hydroelectric reservoir levels were slightly below normal at October 1, but this did not pose a serious problem for winter flows.

In the plains areas, the snowpack was sparse, resulting in very little local runoff. Precipitation over the summer was below normal.

During the 1983-84 fiscal year, 12 projects, eligible for cost-sharing under the Water Resources Grant Program, were investigated. Construction began on three projects, one of which was completed. The remaining projects are under review for future construction.

The Calgary Region issued 77 permits and 10 interim licences for non-consumptive water projects under Section 11 of the Water Resources Act. Licences were issued for 10 projects. A total of 531 inspections were completed for consumptive use water projects, non-consumptive use water projects, enforcement of the Water Resources Act and complaints related to surface water.

Under the Farm Surface Water Management Program, five design requests were received and four designs prepared.

Lethbridge Region: The Lethbridge Region experienced water shortages in areas outside the irrigation districts. The shortages were due to continuing below normal amounts of snow and precipitation as well as a growing demand for additional water rights. The demand for inspections increased in the Bullshead, Gros Ventre and Mckay Creek basins.

The Lethbridge Region received 640 requests for field inspections. During 1983-84, a total of 757 inspections were completed, reducing the previous backlog and leaving 43 outstanding inspections at year end.

The Farm Surface Water Management Program remained constant with 17 requests received and 16 designs provided to the applicant.

The region received 46 applications for permits and 10 applications for non-consumptive water use licences. A total of 40 permits, 31 licences and 17 letters of authority were issued.

Under the Water Resources Grant Program seven projects reached completion during the year. At year end, four projects were under consideration for implementation and 11 projects were under investigation.

Dam Safety Branch

This branch is responsible for administering the Dam and Canal Safety Regulation (Alberta Regulation 351/78). Prior to constructing any water-retaining structure, owners are required to obtain an authorization from the Controller of Water Resources. Successful applicants receive an interim licence authorizing construction of a project based upon drawings and specifications submitted with the application. The Dam Safety Branch also monitors the safety of existing structures.

The Controller of Water Resources refers the eight metres or more in height or 62,000 cubic metres or more in capacity to the Dam Safety Branch for review. During 1983, this branch reviewed 86 applications for licence under the regulation. Engineering reports evaluating the safety of major dams and canals are requested from the licensees and are submitted to the branch for review and evaluation. In 1983, 14 safety reports were submitted.

Field inspections and instrumentation monitoring represent a major part of the work carried out by the Dam Safety Branch. In 1983, about 150 projects, some 11 per cent of the total inventory of 1,380 projects, were inspected. Inspection and instrumentation monitoring of all the major irrigation dams was carried out in 1983. Monitoring of the new Dickson Dam was also regularly carried out during its initial filling. Vermilion Dam was added to the monitoring program.

Hypothetical breach inundation studies were carried out in order to provide emergency preparedness plans on Paddle River Dam, Dickson Dam and Waterton Dam. These studies assist in evaluating the hazard potential of dams and in determining the frequency of inspection and monitoring.

Installation of instrumentation for the monitoring of dams was carried out on Kenex Coulee, Travers Dam and Paddle River Dam.

Administrative Support Branch

The Administrative Support Branch is responsible for the overall budget, financial management, personnel, general office administration, purchasing, accounts payable, inventory control, records management control and consultant contract administration for the division. It provides administration and advisory support to the nine drainage districts in Alberta and also co-ordinates requests for flood analyses and damage appraisals of claims for Alberta Disaster Services whenever such claims relate to works or items where the expertise for their evaluation lies within the department.

Financial Administration Section: This section is responsible for the preparation of the yearly division budget, monthly budget forecasts, purchasing, processing and control of purchase documents, accounts payable, personnel administration, payroll, contract administration, inventory control of fixed assets and attractive items as well as controlled numbered forms. It also co-ordinates accommodation space, parking and the office automation implementation for the division.

Records Administration Section: This section is responsible for the creation, maintenance, retrieval, control and records disposition. These records pertain to the management and licensing of the water resources in the province. They are used mainly by the Water Rights Branch and Regional Services Branch in the administration of the Water Resources Act and the Ground Water Development Act. Drainage district records which are used by Drainage Council in the administration of the Drainage Districts Act are also maintained in this section. Records are stored in three main media — paper, microfilm and computer. The Water Rights Branch provides the computer data. Table 17 illustrates the work performed and a comparison of increase/decrease over the previous two years.

Alberta Disaster Services Activities: The Branch Head was involved with Alberta Disaster Services in co-ordinating the evaluation of 33 storms and flood events. In addition, 14 inspections of flood-related incidents were investigated and 22 damage assistance claims were appraised at the request of Alberta Disaster Services.

PLANNING DIVISION

The Planning Division provides the planning necessary for effective water resource co-ordination, development and management. Specific responsibilities include river basin planning, water resource project planning and benefit-cost analysis and environmental impact assessment of water resource management projects. The division comprises four branches: Southern Region (Oldman, Bow and Red Deer River basins); Northern Region (North Saskatchewan, Athabasca and Peace River basins); Planning Services Branch, responsible for benefit-cost analysis, environmental impact assessment and water-demand forecasting; and Administrative Services Branch, responsible for administrative support to the division. During the past year, division staff supervised 136 consultant agreements totalling approximately $2.7 million. Major activities are summarized below.

River Basin Planning Studies

The study of a river basin as a complete system is an ongoing water resource planning function that defines interdependent water-related activities in the basin.

The result is a flexible water management plan for the basin, continually updated to meet new conditions but comprehensive enough to give a rational basis for developing specific projects. A basin plan includes an inventory of water supplies and water uses and recommended ways of resolving conflicts and meeting future uses.

Athabasca River Basin Planning Program: This program will establish a plan to manage the basin's water resources. Work completed during 1983-84 included the set up and operation of a water balance model which simulates the river basin's surface water supply system and the impacts of withdrawals and storage associated with different development scenarios. A water quality model was also set up to simulate water quality conditions using available water quality data. As a result of this component, a water quality data collection program has been defined and initiated. An overview documenting the information available on fisheries and fish habitat in the Athabasca River system was completed.

Cold Lake - Beaver River Basin: In March, 1983, Alberta Environment Minister the Hon. Fred D. Bradley announced the adoption of a short-term water management plan for the Cold Lake - Beaver River Basin. Adoption of the plan included a commitment to employ one of three long-term alternatives when the limits of the short-term plan are met. Work completed during 1983-84 included the preparation and issue of a study report which summarizes the alternatives and the results of the technical work. An implementation plan was drafted to set out a schedule and the responsibilities for implementing the future commitments made in the short-term plan. The first year of a two-year program of additional water quality investigations to better characterize the Beaver River was completed, and a work program to resolve uncertainties related to the three long-term alternatives was initiated.

McLeod/Athabasca River Basins: A study design was prepared for a water management plan in response to concerns about impacts of potential coal and forestry developments in the McLeod River Basin. This study is a sub-basin study being undertaken within the framework of the Athabasca River Basin planning program. Data collection on surface water hydrology, water quality and erosion sedimentation was initiated.

North Saskatchewan River Basin: As part of the ongoing basin study, the water balance model developed for the South Saskatchewan River was adapted for the North Saskatchewan River. Preliminary results of model studies show that without the regulating influence of Brazeau and Bighorn reservoirs a shortage would occur for the year 2001 demand scenario. This shortage would be due in part to the minimum flow requirement through Edmonton of 100'cubic

metres per second. With these reservoirs in place, demand would generally be satisfied. The fisheries overview for this basin was completed.

Peace River Basin: Forecasts of municipal water supply requirements and an analysis of the safe groundwater yield for 29 towns and villages were completed. A comprehensive study of forecasted water use for the Peace River and adjacent northern basins was completed to identify municipal, industrial, agricultural, power generation and oil and gas industry water requirements to the year 2001. An overview documenting information available on fisheries and fish habitat in the Peace River system was completed.

South Saskatchewan River Basin Planning Program (SSRBPP): Liaison was maintained with the major water management user groups, members of the Alberta Legislature, the Alberta Water Resources Commission, the Alberta Water Resources Planning Advisory Committee and other government agencies. Work continued on use of the water balance model and water quality model for scenario development and evaluation. The water resources management simulator was used intensively in public presentations throughout the South Saskatchewan River Basin. All structure inventories, including those for the irrigation districts, were finalized. Draft reports on regional water use objectives and institutional arrangements for water allocation and management were completed. Work is continuing on evaluating the impact on recreation of various use and management scenarios.

Both the SSRBPP summary report and the SSRBPP scenario report were in final draft form at the end of the fiscal year, and a communications program was developed. The following planning studies contributed to the production of these reports: a low-flow analysis study which provided a frequency analysis of low flows for the main rivers in the basin, a study to define various levels of fish flow requirements and studies on wildlife habitat and ecological considerations in the basin.

Regional Water Resource Management Studies

These studies are made to help plan regional water resource management.

Kneehills Creek: The Kneehills Creek Basin Study was initiated to identify water resource problems and water use conflicts in the basin. The study will analyze current supply and demand, determine future needs and identify and assess alternatives for meeting water management objectives in the basin.

Little Bow River: Work continued on the preparation of a water management plan for the Little Bow River basin. Reports were completed on land irrigability classification, 1983 irrigation water use, structures operations, a diversion to Clear Lake and river basin computer modelling. A summary report is being prepared.

Ross Creek: Additional water use data was gathered, and a computer model was used to determine the effects of existing and potential water use projects in the basin.

Shoal Creek: Economic analyses were undertaken for a proposal to reduce agricultural land flooding along Shoal Creek by channelizing and the construction of cut-offs.

Sounding Creek: Various opportunities for future water management were investigated. Alternatives involved draining unproductive drainage areas, removing inefficient or deteriorated projects and construction of new storage facilities.

Special Areas: An investigation to determine the probability of future droughts, their intensity and possible mitigative measures was initiated. Tasks underway involve determining the characteristics of historical droughts from newspaper reports, files and recorded data.

Vermilion River: A headwaters drainage study to determine the feasibility of draining 911 square kilometres (352 square miles) in the County of Minburn was completed. A combination of hydrologic, environmental and economic factors showed that drainage of this large area is not feasible but that a significant number of acres adjacent to the Vermilion River itself could be easily and profitably drained.

Whitford Lake Basin Water Management Study: This ongoing study was undertaken in mid-1983 to address long-standing agricultural and wetland conservation issues along the Svit Drain and around Whitford and Rush lakes. The study team comprises a multi-agency technical group and an advisory group which represents local interests. Study work completed includes: large-scale infra-red photography of the area; mapping of soils, vegetation and wetland environmental zones, together with supplementary survey cross-sections and profiles; and the development of an economic methodology to evaluate various water management strategies. Photogrammetric mapping around Whitford and Rush lakes yielded 0.5 metre contours and a photo-interpreted shoreline, and further work provided underwater contour and riparian land dispositions.

The technical and advisory groups maintained close contact through joint meetings and field trips. They evolved a Svit water management strategy which, in effect, formalizes the present runoff system while preserving nine major sloughs.

River Basin Project Studies

These studies are aimed at ensuring an interdisciplinary and multi-agency approach to major water resource projects.

Buffalo Bay - Horse Lakes Management Program: The purpose of this program is to develop a water and land management plan that would enhance fisheries, wildlife and agricultural production while maintaining the necessary flow through the Buffalo Bay - Horse Lakes delta. During the 1983-84 fiscal year, three conceptual plans were evaluated and one conceptual plan comprising features of all three was formulated for further investigations. Hydrotechnical models were set up to simulate the ability of the conceptual plan to contain sediment and pass flood flows. An erosion and sedimentation study was completed for the tributary watershed to determine future sediment and debris loads to the delta. These investigations identified the design criteria for the management plan. A preliminary economic evaluation showed that the costs of the proposed plan outweigh the benefits approximately two to one.

Buffalo Lake Stabilization: A project involving a pump diversion from the Red Deer River to Buffalo Lake via Parlby Creek would stabilize the levels of Buffalo Lake to allow orderly development of recreational opportunities and alleviate the agricultural flooding problems that have historically occurred along Parlby Creek downstream of the Town of Alix. However, further studies were required to determine the impact of stabilization on water quality and aquatic weed and algal growth. These studies were carried out in 1983-84: reviewing the characteristics of 21 saline lakes in Alberta, analysis of a sediment core to determine historical chemical characteristics of the lake, laboratory and field biological experiments using mixtures of Buffalo Lake and Red Deer River water, a physical mixing study considering in-lake currents and a mass balance study of salts in the lake.

Dickson Dam Operations: A study was initiated to determine how different operational releases from the Dickson Dam would affect land and facilities downstream of the dam. River cross-sections were surveyed and water level elevations for various release flows were plotted. A survey of land use in the river valley was also undertaken.

Drumheller Flood Control: With the Dickson Dam now providing some flood control benefits to downstream reaches of the Red Deer River, a review and revision of floodplain mapping through the

Drumheller Valley was undertaken. Alternatives for flood damage reduction in the area were identified and assessed.

Fort McMurray Flood Damage Reduction: The joint Alberta Environment - City of Fort McMurray Study Team completed a public review of the 12 flood damage reduction alternatives and obtained public support for proceeding with the analysis of the three most promising alternatives: two dyking alternatives and an ice weir alternative. Detailed investigations of the dyking alternatives were initiated to bring them to the same level of detail as previous studies of an ice weir on the Athabasca River. These investigations will allow the study team to evaluate the three alternatives and recommend a preferred alternative.

Kleskun Lake Project: Economic analyses were completed on a proposed Ducks Unlimited project directed toward creating permanent waterfowl habitat and improving nearby grazing land through a dyking scheme. The project was found to be close to the break-even point in economic feasibility.

Sheerness Deadfish Diversion: An operational study was conducted to determine the most efficient and effective method of operating the Sheerness and Deadfish pump diversion schemes and to provide information for allocating water.

Cardinal Lake: An overview including an economic analysis was undertaken to evaluate the feasibility and implications of a proposal to enhance the recreational opportunities in Cardinal Lake by construction of a lake stabilization structure.

Iosegun Lake: A planning study was undertaken to develop a conceptual solution to overcome problematic low water levels.

Wabamun Lake: As input to the Wabamun Lake Level Advisory Committee, established under the chairmanship of the Edmonton Regional Administrator's office, Planning Division in association with Technical Services and consultant support developed a water balance model for Lake Wabamun to assess the lake level management alternatives. The study concluded that it is not technically feasible to reduce the existing one metre lake fluctuation range.

Wanham (Putio): Economic analyses were undertaken for a proposal to reduce agricultural flood damage near Wanham (Putio) by channel excavation.

Morecambe Structure: Morecambe structure was built to control flooding in the Vermilion River between Morecambe and Two Hills. Although channeling downstream of the structure was planned to alleviate downstream flooding, this channel project was found to be uneconomical and was never implemented. An operational strategy for Morecambe structure is now being developed to control both upstream and downstream flooding.

North Saskatchewan River Near Rocky Mountain House: The Winter Floodplain Monitoring Committee was established in September, 1983, in response to local concern regarding winter flooding potential along the North Saskatchewan River associated with the TransAlta Utilities operation of the Bighorn dam. With both local and government involvement, the committee will maintain ongoing winter monitoring of ice and flow conditions in the Rocky Mountain House area.

Site Development Program

The site development program is administered by the Operation and Maintenance Division. Program objectives are to:

— restore provincial water management project construction sites to near natural conditions;

— improve the appearance of existing and future provincial water management projects; and

— provide those minimal facilities necessary to cope with the public uses of the site.

Planning Division provides the planning support necessary to the program.

Site development plans were completed for Blood Indian Reservoir and Paddle River Reservoir (trout pond and day-use areas). A site development plan for Cadotte Lake is in progress.

Additional Related Studies: The division worked on these additional studies:

— Recreational design support was provided to the Crawling Valley Recreation Association.

— Division staff also assisted Fish and Wildlife Division, Alberta Energy and Natural Resources, in preparing the concept plans and reports for two fisheries public access sites, namely McKinnon Flats on the Bow River and Tyrrell Lake.

— A reservoir area management plan to control recreation and other land uses adjacent to Paddle River Reservoir was completed in co-operation with the County of Lac Ste. Anne and the Yellowhead Regional Planning Commission.

— A draft manual for warning signs and safety devices was completed. Creative Services, Alberta Public Affairs Bureau, is completing the art work for the signs. When completed, the manual will provide staff of Water Resources Management Services with a set of standardized signs (both symbols and wording) and instructions for using and placing the signs that will ensure all proper safety precautions have been taken to maximize human safety at or near water resources structures owned and operated by Alberta Environment.

Data Base and Methodology Development

Economic Evaluation Methodology: Methodologies were developed for determining the distribution of benefits arising from waterfowl habitat enhancement projects. This information will aid in determining the economic feasibility for provincial investment in such projects and provide guidelines for equitable cost-sharing arrangements where investment is considered.

Economic evaluation methodology development was also undertaken for application in the South Saskatchewan River Basin Planning Program to compare alternative water management strategies.

Environmental Assessment: Considerable progress was made in developing methods for estimating instream flow requirements for fish habitat. A computerized system was developed to provide instream flow evaluations, using existing hydrologic data, suitable for use in initial planning and in feasibility studies. These methods were tested with good success in conjunction with the South Saskatchewan River Basin Planning Program and on a project carried out in co-operation with Fish and Wildlife Division on the Highwood River.

The fishways design project advanced to the evaluation stage with the fishways installed on Fawcett Lake, Lesser Slave Lake outlet and at the Beaverlodge River weir.

Water Use Data: Work began on restructuring the water use data storage and retrieval system in order to expand its capabilities to include water-related data as well as water use data. Industrial water use data and data on water used for oil well injection were compiled. The new system design allows for on-line retrievals and an expanded range of reporting capabilities.

Policy and Program Review

Agricultural Land Base Study: In co-ordination with the departments of Alberta Agriculture, Energy and Natural Resources,

Transportation and Municipal Affairs, Environment undertook its share in the initial stages of a major interdepartmental study to find ways of intensifying and expanding the agricultural land base in the province. The department's main interest is in the water planning and management implications of such farm-related activities as increased irrigation water demand and increased drainage activity. With the exception of an inventory of drainable wetlands, this study is being undertaken with existing resources. The drainage study component is being funded by the Alberta Water Resources Commission and managed by an interdepartmental steering committee.

In addition to the above, Planning Division provided advice to the Economic Subcommittee of the Agricultural Land Base Study on appropriate evaluation techniques to be employed in comparing various alternatives for increasing agricultural productivity in Alberta.

Irrigation Efficiency: A report on irrigation efficiencies was prepared in the fiscal year 1983-84. This report analyzes the traditional methods of measuring irrigation efficiency, compares reported efficiencies achieved in Alberta with those in other countries, analyzes historical efficiencies in 12 irrigation districts in Southern Alberta and discusses the cost effectiveness of increasing water supply by reducing conveyance losses as compared with reservoir construction. The report recommends a study program to: resolve the uncertainty of the nature, extent and cause of irrigation inefficiency and identify measures and their feasibility for improving irrigation efficiency in southern Alberta.

Recreation Development of Reservoirs: The policy proposal for recreation development along reservoirs owned by the Province of Alberta was approved in principle by Water Resources Management Services and will be submitted to the Water Resources Commission for review.

Additional Planning Services

Mitigation of Environmental Impacts: Planning Division provided environmental mitigation designs for the Lesser Slave Lake stabilization project (fishway), Forty Mile Coulee, Badger Lake and Crawling Valley Reservoir sites (archaeological resources) and Crawling Valley Reservoir (replacement of wetland habitat).

Interdepartmental Resource Planning: In several areas of the province, division staff contributed to the Integrated Resource Planning Program of Alberta Energy and Natural Resources.

Irrigation: The Planning Division studied the impact of the chemical control of aquatic weeds in main irrigation canal systems with a major emphasis on the effectiveness of the practice and on the impact on fish.

Office of the Director

The director was appointed to, or continued departmental representation on, the Alberta Hydro Committee, the Resource Integration Committee and the Alberta Water Resources Planning Advisory Committee and was an alternate member of the Prairie Provinces Water Board.

OPERATION AND MAINTENANCE DIVISION

The Operation and Maintenance Division provides the necessary services and activities to operate and maintain provincially owned water-control structures throughout the province.

The division is structured into three branches and two groups: Irrigation Headworks, Projects Management, Equipment and Materials, Special Projects and Administrative Services.

Both the Irrigation Headworks and Projects Management branches are project oriented, providing operation and maintenance services for provincially owned water projects.

The Equipment and Materials Branch provides warehousing, sales, equipment rental and material purchasing services to the Water Resources Management Service for the province's Water Management and Development Program.

The Special Projects Group is responsible for planning and implementing unique projects that will become the responsibility of the division upon completion and additionally manages the Site Development Program, the Northwest Alberta Erosion Control Program and the Special Areas Project.

The Administrative Services Group provides all administrative services for the division.

Irrigation Headworks Branch

The branch continues to operate and maintain the irrigation headworks systems which directly serve eight irrigation districts in southern Alberta. They are the St. Mary River (SMRID), Lethbridge Northern (LNID), Bow River (BRID), Western (WID), Mountain View (MVID), Leavitt (LID), Aetna (AID) and Magrath (MID). Two additional irrigation districts, Raymond (RID) and Taber (TID), are served by water conveyed through the works of the SMRID. Approximately 325,000 hectares (803,000 acres) of land are irrigated by water diverted from the five provincially owned irrigation headworks systems.

The remaining three irrigation districts, Eastern (EID), Ross Creek (RCID) and United (UID), were unable to finalize land title transfers, thereby impeding the proposed take-over of their headworks systems by the province. In the interim, the province is continuing the funding of necessary rehabilitation work to ensure the integrity of the UID and RCID works. Final designs are being prepared for the rehabilitation of the Bassano Dam (EID) under terms of a 1973 federal/provincial agreement.

An agreement finalized on April 30, 1981, between the province and the Peigan Band Council has allowed continued access through the Peigan Reserve to the LNID provincial headworks, acquisition of extra right-of-way for enlargement of the main canal through the reserve, the construction of a new diversion weir on the Oldman River and the relocation and construction of a new flume over the river. Contracts for the construction of these works were let in 1982. The Oldman River flume, the Oldman River diversion works and about 10 kilometres of the main canal have been completed and are now in operation.

Until the remaining rehabilitation work is completed, the branch will continue to repair and maintain the existing works to assure the integrity of the LNID system. Major activities of the branch on the system included repairs to the Rocky Coulee and Keenex syphons, installation of cattle guards on the rehabilitated canal banks and raising of the old canal banks in numerous places to accommodate anticipated increased flow in the canal. Due to the heavy water demand and inadequate storage in the Keho Lake, the LNID were forced to shut off irrigation water to the users twice in 1983.

The original telemetry and remote control system on the LNID headgates has been modified and re-installed on the new headgate structure.

On the Waterton - St. Mary headworks system, rock anchor bolts were installed into the St. Mary spillway slab to ensure stability. Approximately 1,500 metres of joint sealant was placed. Two 304.8

millimetre diameter ball valves were installed in the bypass line in the St. Mary Dam diversion tunnel, and one irrigation gate was modified to eliminate cavitation. Eight stop-log bays were repaired to prevent twisting of the stop-logs when being removed while cathodic protection equipment was upgraded on existing installations. A relief well was installed to relieve water pressure on the Waterton Dam acquifer created by Waterton reservoir. One mile of the Belly - St. Mary canal was desilted and about 11 kilometres of the Pothole to Ridge Reservoir Canal were protected by placement of rock. Two timber farm bridges were also constructed on the canal.

On the Mountain View - Aetna System 300 metres of canal were rebuilt to increase the capacity and eliminate seepage. Cathodic protection was installed on canal underdrains to prevent corrosion of pipes. Two farm crossings were also built.

Rehabilitation work on the Carseland - Bow system which serves the BRID included the placement of bank protection material (gravel facing) on selected sections of the canal banks, replacement of the upstream slope protection of South McGregor Dam and safety fence installation at several main canal structures. Construction for the replacement of the West Arrowwood syphons has been delayed.

The rehabilitation of the headworks system for the WID consisted of cleaning and regrading of approximately two kilometres of the canal and placement of bank protection material near Chestermere Lake. The Weir Safety program was further enhanced by the installation of floating signs on the Bow River to direct boaters to the portage entrance. An emergency boat launch site was constructed and a no boating zone was established at the weir. An information campaign was also initiated which included news releases, newspaper ads, brochures and a display board, and a media day was held outlining the above.

On the United Irrigation District headworks system, a farm crossing was built on the main canal.

The division's radio communications network in southern Alberta was completed and is now functional. Direct radio and telephone communications are available to the division's staff for almost all of the southern part of the province through three repeater stations located at Keho Lake, Cypress Hills and Buffalo Hills.

Significant progress was recorded in the coding and inputting of technical data on the branch's computer plan retrieval data base.

The hydrological computer program was enhanced to include reservoir storage data for the irrigation districts on the weekly hydrological computer printout.

The land administration section of the branch continued to transfer to the BRID required canal right-of-way pursuant to the 1975 provincial/district agreement. The section initiated the preparation of the right-of-way land schedules for the headworks systems to facilitate the proposed transfer of surface rights from Energy and Natural Resources to Environment. The section also continued to deal with numerous land use and disposition applications affecting the provincial headworks right-of-way.

A total of 1,412,000 cubic decametres (1,145,000 acre feet) of water was delivered to the irrigation districts during the 1983 seasons, apportioned as follows:

Table 18

Water Delivered to Irrigation Districts During 1983

	Cubic Decametres	Acre Feet
St. Mary River (including TID and RID)	633,000 dam^3	(513,000 acre feet)
Bow River	385,000 dam^3	(312,000 acre feet)
Western	181,000 dam^3	(147,000 acre feet)
Lethbridge Northern	175,000 dam^3	(142,000 acre feet)
Mountain View - Aetna - Leavitt	26,000 dam^3	(21,000 acre feet)
Magrath	12,000 dam^3	(10,000 acre feet)

Projects Management Branch

The objective of the Projects Management Branch is to operate and maintain provincially owned, non-irrigation water control projects to ensure maximum water resource benefits for Alberta. The dams, reservoirs, canals and drainage channels also create wetlands for wildlife habitat and lakes for water-based recreation.

Thirty-nine water-control structures are operated by the branch, which provide flood control, recreation, wildlife habitat, water conservation, stream flow regulation and assured water supplies for many towns and villages.

To ensure the integrity of provincially-owned and improvement district structures, annual inspections and regular maintenance is undertaken. In 1983-84, remedial and preventative maintenance was completed on 82 structures and 135 inspections were carried out at various projects throughout the province.

1983-84 became the first year of operation of the Dickson Dam. Successful operation of the project allowed the requirements of the Interprovincial Water-apportionment Agreement to be satisfactorily met.

Major Maintenance: The central sector repaired eroded channels and dykes and removed log jams on reaches of Bearberry Creek, Pembina River, Paddle River, Vermilion River and Pigeon Creek. Structure repairs were undertaken at Fawcett Lake and Cross Lake.

In the southern sector, water supply is limited and every effort is made to maximize the use of available water. Canal maintenance was undertaken at Squaw Coulee, Little Bow Canal and Bare Creek. Structural repairs were undertaken at Bare Creek, Reesor Lake and Little Bow Canal. Emergency spillways were installed at Michelle Reservoir, Reesor Lake and McAlpine Reservoir. A total of 29,857 acre feet (38.6 million cubic metres) of water was diverted through the Squaw Coulee and Little Bow canal projects during the past year.

Major maintenance in the Grande Prairie and Peace River sectors included work on the South Heart River Dam No. 1, McLennan - Girouxville canal, Doucette Drainage, West Prairie River structure, Manning Drainage, Notikewin Drainage, Hotchkiss Drainage, Kleskun Hills Drainage, Stoney Lake, Spring Creek Basin and Fox Creek projects. Additional major maintenance work included gabion installation and structure rebuilding on Gordey Drainage.

Stabilization Projects: Two of the lake stabilization projects that the branch operates are Gull Lake, located 12.9 kilometres west of Lacombe, which had steadily declining lake levels from 1938 until 1976, when pumping operations began; and Lac Ste. Cyr, located 19.3 kilometres southeast of the Town of St. Paul, which had declined 2.7 metres since 1959, before pumping began in 1978.

Both lakes are used extensively for recreation such as boating and swimming. Lac Ste. Cyr is also the source of water supply for the Town of St. Paul.

The target stabilization levels were agreed upon by the local counties, villages and the Government of Alberta. The purpose of pumping is to ensure the continued recreational potential of Gull Lake and maintain Lac Ste. Cyr at a suitable level to assure St. Paul a constant water supply.

The stabilization level at Gull Lake was reached far ahead of schedule in 1982 and has been maintained above that level through to the end of the 1983-84 fiscal year and, therefore, pumping was not required during the last year. Pumping operations at Lac Ste. Cyr has raised the lake to within .23 metres of our target stabilization level as of March, 1984.

Emergency Water Supply Program: The Emergency Water Supply Program was established to assist and supervise the pumping of water for communities throughout Alberta experiencing municipal water supply problems.

In 1983-84, four communities were assisted with emergency pumping: Paddle Prairie, Little Buffalo, Eaglesham and Fairview.

Equipment and Materials Branch

The Equipment and Materials Branch is a service oriented group providing support to Water Resource Management Services. The branch has several functions:

Equipment Section: The Equipment Section provides an equipment pool service to the department's Water Resources Management Services.

During the year, this section completed rock rip-rap protection at Wally's Beach on St. Mary Reservoir, constructed concrete pre-fab boat ramps and picnic tables for site development at McGregor Lake, resloped reservoir banks, constructed a parking lot and day-use area at Jensen reservoir, removed silt and repaired the fish ladder at the Carseland Weir, cut 800 m^3 of firewood for day-use sites under the PEP program and carried out major maintenance work on the Lethbridge Northern Irrigation District and Western Irrigation District canals as well as South McGregor dam. At Dickson Dam the section assisted in reclaiming and topsoiling two gravel pits and in constructing an access road, parking area and recreational day-use area on the south side of the dam. Additionally, the section staff co-ordinated and contracted work on landscaping around the control building and fish pond.

Materials Section: With warehouse and yard storage facilities in Edmonton, Lethbridge, Grande Prairie and Peace River, the section manages an approximate $0.36 million materials inventory. Management includes the provision of ordering, stockkeeping, warehousing, materials sales services and equipment leasing functions directly serving the department's Water Resources Management Services. Receiving and storage services are also provided for all areas of the department as required.

Revolving Fund Accounts Section: The accounts section monitors and processes payments to vendors, sends out invoices to users for items sold or rented, monitors revenue and expenses and reports to management on financial status, as well as preparing and monitoring the Revolving Fund Budget.

Central Vehicle Services: The vehicle co-ordinator for Alberta Environment administers the vehicle pool for the department throughout the province. Approximately 500 vehicles such as half-ton pick-ups, ¾ ton pick-ups, suburbans, four-wheel drive vehicles and crew cabs were issued this year on a permanent, seasonal and short-term basis.

Special Projects Group

The Special Projects Group was formed in response to a need for a greater divisional input into the development of projects presently in the planning or construction stage and will be managed by the division upon completion. Special projects is also responsible for the implementation and management of unique projects and programs which do not fall within the division's normal operation and maintenance functions.

Northwest Alberta Erosion Control Program: The objective of this program is to rehabilitate to acceptable engineering standards those existing drainage ditches and flood control channels in northwestern Alberta which have deteriorated to various degrees since original construction.

Rehabilitation during 1983-84 consisted of improvements to 30 kilometres of channel, which included several grade control structures and upgrading the capacity of road and farm crossings, and the reclamation and seeding of 25 kilometres of channel right-of-way. Additionally, brush adjacent to 15 kilometres of channel was removed in preparation for 1984-85 rehabilitation works.

Under the Northwest Alberta Erosion Control Program, 15 private contractors were hired to carry out the project reconstruction.

Special Areas: During the fall of 1983, the Deadfish Creek Diversion System was commissioned, enabling the delivery of winter stock watering supplies to ranches along the lower Berry Creek. The project is capable of supplying water to irrigate approximately 2,500 hectares of land. Staff are preparing to take over the Sheerness Water Supply System upon completion of construction. This project will provide irrigation water to approximately 6,000 additional hectares of land.

Site Development Program: This program involves the reclamation and revegetation of areas disturbed by construction of water management projects. Day-use facilities are provided during the reclamation to accommodate existing needs for recreational activity, protect wildlife habitat and direct the public away from potentially dangerous areas.

During 1983-84, upgrading commenced on Milo Park at Lake McGregor. Shelterbelts were installed at Dickson Dam and reclamation of an off-site gravel pit was started. Grading and topsoiling of three day-use areas continued at Dickson Dam. A small trout pond was constructed at Dickson Dam within the downstream valley. Boat launches were installed at Jensen Reservoir, Milk River Ridge Reservoir and Buck Lake. A third portion of the Max Bell State Park pathway was completed. Upgrading commenced at Figure Eight Lake.

Native forb seed production continued at the Alberta Environmental Centre and trial plots were planted along the Sheerness Blowdown Canal and Deadfish Water Supply System. The production of native shrubs commenced for revegetation of harsh cut slopes at Dickson Dam. Tendering of the production of native trees and shrubs was initiated for the revegetation of borrow pits and cut slopes of Paddle River Dam. The Site Development Program shared the cost of water quality survey by Pollution Control Division to establish base-line data for southern Alberta reservoirs.

Maintenance of site development projects was continued with increased involvement of the private sector. Sanitary maintenance is carried out by local individuals at each site. Horticultural maintenance has been tendered to local firms within three regions.

Twenty-five sites have been established to date on 18 lakes and reservoirs within Alberta.

Administrative Services Group

The Administrative Services Group administered division activities related to personnel, finance, staff development and budget during the past year. The group also provided financial control for a number of revenue producing agreements dealing with the use by others of several provincial water management projects.

Office of the Director

The Director served as the department's representative on the Official's Committee on Native Land Claims and the Native Career Opportunities Program Committee, as Secretary to the Irrigation Implementation Board and as a member of the Provincial Water Management Committee.

ENVIRONMENTAL EVALUATION SERVICES

K. R. Smith
Assistant Deputy Minister

J. M. King
Director
Land Reclamation Division

Vacant
Director
Environmental Assessment Division

Environmental Evaluation Services promotes the integration of land-related resource development and environmental management to further the department's goal of balancing environmental quality and industrial development.

This goal is supported by requiring environmental impact assessments for major developments, issuing development and exploration reclamation approvals and maintaining liaison with regional planning commissions and the Energy Resources Conservation Board, through administration of restricted development areas.

The responsibility for property management of the Crown-owned lands in the transportation/utility corridors and the land acquisition responsibility of the Land Assembly Division were transferred to Alberta Public Works, Supply and Services, in August, 1983. The Restricted Land Use Branch continues to be responsible for the transportation/utility corridor design and implementation.

During the past year, Alberta Environment initiated the review and refinement of administrative procedures with the Energy Resources Conservation Board (ERCB), Hydroelectric Department. These two agencies also continued to streamline procedure for the preparation of information regarding environmental matters at ERCB public hearings.

The Land Reclamation Program under the Heritage Savings Trust Fund continued its activities in research and in the reclamation of abandoned and derelict industrial lands. A total of $4.0 million was invested in reclamation, of which $1.5 million was for research.

Total expenditures by the service funded by the General Revenue Fund were $3.9 million.

LAND RECLAMATION DIVISION

The Land Reclamation Division administers the Land Surface Conservation and Reclamation Act and the regulations under the act, including the Land Conservation Regulations, the Regulated Coal Surface Operations Regulations, the Regulated Oil Sands Surface Operation Regulations, the Security Deposit Ministerial Regulations, the Regulated Lake Shoreland and Development Operation Regulations, Part 3 Administrative Transfer Regulation, the Council's Administrative Jurisdiction Regulation, the Stop Order Appeal Regulation and the Inquiry Procedure Regulation.

These regulations involve the review of dispositions, applications and impact assessments of proposed surface-disturbing activities and the granting of conditional approvals which ensure that reclamation standards are achieved. The objective is to provide maximum practical protection for the maintenance of shores, watercourses, valleys, sensitive watershed and alpine areas and rural lands.

In addition to the administration of this legislation, the division carries out inspections, reclamation projects and special studies to enforce and improve the practice and standard of reclamation and environmental planning.

The Surface Reclamation Fund, which is administered by this division, consists of security deposits in the form of cash, securities and letters of guarantee required to ensure satisfactory reclamation on projects for pipelines, sand and gravel operations, coal exploration and development and oil sands exploration and development. See the Financial Statement at the end of this annual report for information regarding security amounts received and refunded.

Total expenditures for the division were $2.7 million.

Land Conservation and Reclamation Council

The council, established by the Land Surface Conservation and Reclamation Act, is composed of reclamation officers who monitor surface disturbances to ensure satisfactory reclamation. The reclamation officers may issue orders for reclamation of disturbed lands and certify that reclamation is satisfactory. The council's jurisdiction includes all of the 76 counties, municipalities, special areas, Metis colonies, Native reserves and parts of improvement districts. The total cost of its operation was $1.3 million.

The 20 provincial reclamation officers and 163 municipal government reclamation officers issued 110 reclamation orders, down from 114 a year earlier, and 1,396 reclamation certificates, up from 1,058 the previous year, for the reclamation of abandoned well sites, pipelines, battery sites, coal and oil-sands operations.

Seventy-six reclamation certificates were issued on coal exploration approvals, up 28 from the previous year. Nine reclamation certificates were issued for oil-sands exploration approvals, down seven from a year earlier.

Crown Mineral Disposition Review Committee: This committee was established under Part 2, Section 15, of the Land Conservation Regulations (Alberta Regulation 125/74).

The committee reviewed applications relating to coal, oil sands, quartz and oil and gas. Oil and gas leases and licences constituted more than 95 per cent of the review workload. As a result of that review, a total area of 1,380,276 hectares was offered for sale by open tender.

Exploration Review Committee: This committee was established under Part 3, Section 19, of the Land Conservation Regulations (Alberta Regulation 125/74).

The committee reviews coal exploration applications referred by the Land Conservation and Reclamation Council. The review emphasis is on minimizing surface disturbances, determining that proper reclamation is achievable and determining that proposals are consistent with different agency policies.

Table 21

Subdivision Referral Activities

Planning Authority	No. of Applications 1983	1982	Per cent Change
Battle River Regional Planning Commission	120	89	35
Calgary Regional Planning Commission	174	265	34
Edmonton Metropolitan Regional Planning Commission	95	143	34
Mackenzie Regional Planning Commission	79	—	
Oldman River Regional Planning Commission	117	124	6
Palliser Regional Planning Commission	136	95	43
Peace River Regional Planning Commission	4	147	97
Planning Services Division (Municipal Affairs)	167	233	28
South Peace Regional Planning Commission	52	—	
Red Deer Regional Planning Commission	163	207	21
Southeast Alberta Regional Planning Commission	38	71	46
Yellowhead Regional Planning Commission	106	118	10
City of Lethbridge	2	3	33
City of Fort McMurray	9	—	
City of St. Albert	8	9	11
Town of Airdrie	1	—	
County of Grande Prairie No. 1	67	—	
County of Parkland No. 31	33	46	28
County of Strathcona No. 20	12	—	
Municipal District of Rocky View No. 44	21	—	
Total	1404	1550	9

Grande Prairie, Parkland and Strathcona and the Municipal District of Rockyview refer applications to this branch. The branch comments on behalf of the department on compliance with the Land Conservation Guidelines, susceptibility to flooding, bank and slope stability, erosion hazard, surface drainage, availability of a domestic groundwater supply, potential air and water pollution and the suitability of the soil for sewage disposal. Comments lead to recommendations for refusal or conditional approval.

Cottage resort and country residential proposals adjacent to lakes continue to create potential overcrowding and sewage problems. Much time was taken reviewing these applications with developers and discussing the potential implications of sewage contamination, erosion due to vegetation removal and physical overcrowding and overuse of the lakes.

The number of applications processed decreased slightly from 1,550 in the previous year to 1,404, reflecting the general downturn in the economy and a large oversupply of country residential lots (Table 21).

Staff represented the department at Alberta Planning Board hearings throughout the province as a result of appeals by subdivision applicants.

In addition to subdivision referrals, staff reviewed development permit applications for various rural municipalities, including the counties of Lacombe, Lac Ste. Anne, Lethbridge, Strathcona and Wheatland and the municipal districts of Foothills Rockyview and Taber.

Lake Shoreland Regulations: The branch continued the administration of the Regulated Lake Shoreland Development Operation regulations which were proclaimed on August 24, 1977 (Alberta Regulation 233/77).

These regulations are pursuant to sections 21, 23 and 25 of the Land Surface Conservation and Reclamation Act. Specified areas around Lake Isle and Lac Ste. Anne were subject to the regulations.

Five subdivision and development applications were affected by these regulations. Three proposals were determined not to be subject to the regulations.

Development of land for industrial or recreational purposes and unsubdivided land to be used for residential development will not be allowed until a lake management plan and lake management land-use bylaw have been completed and adopted.

Annexations: Staff reviewed and inspected 14 applications for annexation of rural lands to urban municipalities as a result of referrals from the Local Authorities Board.

Industrial Plant Sites: Staff were involved in the review of a number of environmental impact assessment reports submitted by proponents for coal mines, gas plants and heavy oil pilot plants.

Regulated Operations Branch

The Regulated Operations Branch prepared the operational terms and conditions for development and reclamation approvals for major pipelines and gravel operations. In addition, the branch provided major input into the review and approval of development and reclamation applications which came before the Development and Reclamation Review Committee. The branch also reviewed major transmission line applications and made recommendations for ministerial approval.

Since 1982, and enactment of the Sand, Gravel, Clay and Marl Surface Operations Regulation, a major function of the branch has been to notify pit operators of the regulation and assist them in obtaining the required approvals. This process will continue until all operators in the province have been contacted.

Total expenditures of the branch were $0.56 million.

Linear Projects Section: This section is responsible for the department's review and approval process for high voltage electric transmission lines and oil and gas pipelines referred to it by the ERCB. In conjunction with its co-ordination responsibilities, the section participates at all major ERCB pipeline and transmission line hearings, actively cross-examining on issues related to the protection of the environment. The section also initiated a number of pipeline studies which, it is hoped, will lead to further understanding and co-

During 1983, 42 programs were reviewed and recommended for approval. This is a 25 per cent increase from 1982; however, the total number of drill holes proposed was down by 20 per cent.

Development and Reclamation Review Committee: Established under Part 4, Section 21, of the Land Conservation Regulations 125/74, the committee's purpose is to provide an interdepartmental and interdisciplinary detailed technical review of major proposed regulated surface-disturbance operations. The committee then recommends operational terms and conditions to be attached to the development and reclamation approvals issued by the Minister. The committee submits its recommendations to the Chairman of the Land Conservation and Reclamation Council.

During the 1983-84 fiscal year, the committee dealt with numerous applications for Development and Reclamation Approval, and approvals were issued to the following companies (amendments to existing approvals are noted):

— Syncrude Canada Ltd. — S-5 Discard Site;
— Esso Resources Canada Limited, Cold Lake Production Project, Phases I and II;
— Luscar Ltd. — Paintearth Mine;
— Syncrude Canada Ltd. — (five-year amendment);
— Manalta Coal Ltd. — Vesta Mine — (major amendments);
— Cardinal River Coals Ltd. — (major amendments);
— Gregg River Resources Ltd. — (major amendments);
— Union Oil Company of Canada Ltd. — Obed-Marsh Project — (major amendment);
— TransAlta Utilities Corporation — Highvale Mine — (five-year amendment);
— Luscar Sterco (1977) Ltd. — Coal Valley Mine — (major amendments);
— Fording Coal Ltd. — Edmonton Power — Genesee Mine — (minor amendment);
— Manalta Coal Ltd. — Montgomery Mine — (minor amendment); and
— Smoky River Coal Limited — (minor amendment).

The McLeod River and Mercoal projects received Energy Resources Conservation Board approval in 1983; however, applications for development and reclamation approval were not submitted to the committee due to the continuing lack of coal markets.

In September, 1983, the committee toured Manalta Coal's Vesta Mine and Luscar's Diplomat and Paintearth Mines. The oil-sands operations of Suncor Inc. and Syncrude Canada Ltd. at Fort McMurray were the site of a two-day field trip in early October, 1983.

Reclamation Branch

The Reclamation Branch is responsible for the reclamation of abandoned or derelict lands; the investigation of material-handling techniques relating to the reclamation of surface-disturbance operations; and providing a soil sampling and analysis service to the department on problem reclamation areas which are under the jurisdiction of the Land Conservation and Reclamation Council.

The Reclamation Branch administers the Land Reclamation Program which receives funding from the Alberta Heritage Savings Trust Fund. This program is involved in both operational reclamation and reclamation research. Funds were provided to Energy and Natural Resources for reclamation projects located on public land.

Funding was provided to reclaim a total of 108 project sites which returned the disturbed land to some type of beneficial use. There were 88 projects located on municipally owned lands and 20 projects on Crown land (refer to Table 19). The reclamation of abandoned garbage dumps (28) and sewage lagoons(22) on municipally owned land still remain the major types of projects undertaken by the branch.

Table 19

Reclamation Projects

Nature of Disturbance	Municipal	Public	Green Area	Total
Access Roads			5	5
Garbage Dumps	28	1		29
Sewage Lagoons	22	1		23
Sand and Gravel Pits	12	6		18
Seismic Lines and Coal Exploration Trails			1	1
Water Storage Sites	7			7
Derelict Areas	3		1	4
Industrial Sites	4	2		6
Abandoned Coal Mines	5			5
Mine Hazards	6			6
Abandoned Wellsites	1		3	4
Total	88	10	10	108

The research programs investigating the reclamation of abandoned coal mine areas at Forestburg South and Bow City have continued from last year. Research at Forestburg has indicated that application of bottom ash to sodic spoil will produce satisfactory results for vegetative growth. Work will now be undertaken to apply bottom ash to approximately 64.75 hectares of spoil.

At Bow City, calcium chloride has been applied as a soil amendment to sodic spoil with revegetation to be undertaken in the spring of 1984.

The soil sampling and analysis support section of the department took 847 soil samples on 25 individual sites (refer to Table 20).

Table 20

Soil Sampling Program

Type of Site	No. of Sites	No. of Samples Taken
Abandoned Coal Mines	2	127
Gravel Pits	1	19
Ongoing Coal Mines	0	0
Other	2	10
Pipelines	2	150
Plots	3	383
Wellsites	15	158
Total	25	847

Regional Land Use Branch

The branch assesses and evaluates major land-use allocations, public land-use assignments, subdivision developments and industrial sites. The branch's objective is to prevent the irreversible allocation of high-quality agricultural, recreational and high water-yield lands and quality water bodies to incompatible uses. Total costs associated with this function were $0.28 million.

Subdivision Referral System: Major urban residential, country residential or cottage resort developments and all proposed subdivisions adjacent to water bodies were reviewed and assessed for potential impact.

The 10 regional planning commissions, the planning services division of Alberta Municipal Affairs, the cities of St. Albert, Ft. McMurray and Lethbridge, the Town of Airdrie, the counties of

Table 22
Ministerial Consents Summary (April 1, 1983, to March 31, 1984)

RDA	Total Requests	Consent	Refusal	No Consent Required	P/W*	Total 1974-84
Blue Ridge	0	2	0	0	0	6
Calgary	106	75	1	7	23	964
Capital City Park	3	1	0	1	1	27
Edmonton	64	35	2	3	24	370
Edmonton/Devon	19	10	1	3	5	120
Edmonton/Ft. Sask.	11	7	0	2	2	87
Fish Creek	0	0	0	0	0	11
Fort McMurray	5	5	0	0	0	43
Lethbridge	8	4	0	1	3	60
Pinehurst Lake	0	0	0	0	0	2
Sherwood Park West	11	4	2	2	3	62
Strathcona	1	1	0	0	0	5
Turtle Mountain	1	0	1	0	0	10
	229	144	7	19	61	1,767

*Pending or Withdrawn

operation between the government and the oil and gas industry on environmental issues.

Transmission Lines: The section reviewed and approved a total of 29 applications for electric transmission lines and substations, down 22 from 1982.

Pursuant to Section 13 of the Hydro and Electric Energy Act, all electric transmission line and substation applications must receive the approval of the Environment Minister insofar as they affect matters of the environment.

The review and approval process for electric transmission lines consists of two components: the preliminary government review; and the Energy Resources Conservation Board (ERCB) application review.

Preliminary Government Review: Alberta Environment co-ordinates an environmental review of transmission lines prior to a utility company making application to the ERCB. Preliminary environmental data submitted by the proponent is forwarded to a number of government departments. The concerns and comments of these departments are then conveyed to the proponent.

ERCB Application Review: After an application has been made to the ERCB, they refer the application to Alberta Environment. The section co-ordinates an environmental review and provides comments and recommendations to the ERCB with respect to the potential environmental impact of proposed transmission lines.

Section staff represent the Crown or assist the Solicitor of the Attorney General's Department in representing the Crown at the ERCB hearings.

Section members actively represented the Crown at the following ERCB hearings:

— Edmonton Power's 500 kV Transmission Line, Genesee Area;
— TransAlta's 138 kV Transmission Line, High River — Black Diamond;
— Alberta Power's 144 kV Transmission Line, Flyingshot — Elmworth; and
— TransAlta and Alberta Power's 240 kV Transmission Line, Langdon — Anderson.

The section reviews the ERCB decision reports and evidence presented at the hearings as it affects matters of the environment and makes recommendations to the Minister of the Environment for Ministerial Approval with or without conditions.

Pipelines: The section reviewed a total of 532 applications for pipeline projects in the province, down 56 from the previous year. Of this total, 23 applications required development and reclamation approval pursuant to the Regulated Oil and Gas Pipeline Surface Operation Regulations. All applications were referred to the department by the Energy Resources Conservation Board.

Regulated pipeline applications were reviewed by the Department and other government agencies responsible for the management of the province's natural resources. Approvals were granted after reviewing detailed environmental reports consisting of an environmental overview, an impact assessment, a route selection process and an environmental protection plan.

The section commissioned a number of studies which deal with pipeline construction and reclamation. A manual is being assembled which describes a number of appropriate construction procedures for installing pipelines on agricultural land given certain soil conditions, land use and weather conditions. A handbook which documents a variety of commonly used environmental specifications is being designed for pipeline contractors and engineers. In addition to these documents, the division's "Information Requirements for Regulated Pipelines" is being updated.

The section participated in more than 10 ERCB hearings for pipeline applications. Issues such as route selection and topsoil conservation have been the main environmental concerns of most of the hearings.

Non-regulated pipeline applications continue to be reviewed for compliance with the Land Surface Conservation and Reclamation Act and applicable regulations. Minimum reclamation standards are referred to all operators prior to pipeline construction.

Sand and Gravel Section: In 1982, the Sand and Gravel, Clay and Marl Surface Operations Regulation A.R. 228/82 was enacted. Under this regulation, all large sand, gravel and clay operations on patented land in the province require a development and reclamation approval.

An inventory and notification program was continued during the year to record all operations and to notify the landowners and holders of a gravel lease of the regulation requirements. This program will be continued until all operations on patent land have been recorded and all active operations have received development and reclamation approval.

In 1983, the program focussed on 13 counties which contained 359 gravel operations. A total of 186 operations required develop-

ment and reclamation approval. The remaining operations were either inactive or were of a minor size which did not require development and reclamation approval.

Eighty-one applications for development and reclamation approval were reviewed in 1983. Sixty-three development and reclamation approvals were issued to private developers, counties, Alberta Transportation and Alberta Environment operations. The sand and gravel referral system reviewed 85 proposed highway projects submitted by Alberta Transportation.

Coal and Oil Sands Section: The branch is represented on the Development and Reclamation Review Committee, the Exploration Review Committee and the Crown Mineral Disposition Review Committee and provides recommendations on the reclamation and land use aspects of proposals. This input may include the review of other departmental agencies. In addition, the branch assists the Land Conservation and Reclamation Council by the co-ordination of the review and preparation of approvals for small coal mines and experimental oil-sands projects which are not referred to the Committees. Eight oil-sands test site applications were reviewed and approvals recommended.

Restricted Land Use Branch

The Department of the Environment Act (Section 16) provides for the designation of restricted development areas (RDAs) within the province. Thirteen designations have been made since 1974. The need of special environmental management in certain areas and the need for protection of transportation/utility corridor lands have been the two basic reasons for RDA designations, although the purposes for the various RDAs differ somewhat. Administration of the 13 RDAs is the responsibility of the Restricted Land Use Branch.

Within each RDA, subdivision and development applications and, in fact, most proposed land use changes are reviewed to determine whether they conform to the regulations set up for the particular RDA. Approval from the Alberta Environment Minister is required before any intensification or change in land use can occur.

During the past year, 229 requests for ministerial consent were received. Of these, 142 were granted approval, seven were refused and 19 were of a minor nature and did not require consent. The remaining applications were awaiting a decision, withdrawn or regarded as information. The more active RDAs in the province, in terms of applications processed, were the Calgary and Edmonton RDAs (see Table 22).

Once designated, RDA boundaries are not entirely static but may be refined as more information becomes available. Minor amendments involving small deletions of land or clarification of boundaries were made to several of the RDAs.

The Restricted Land Use Branch is actively involved in studies related to RDA programs. During 1983-84, work was continued that will lead to evaluation of land-use capability for critical portions of the Edmonton — Devon and Edmonton — Ft. Saskatchewan RDAs. Work was also continued on drainage issues and access concerns relative to the Calgary and Edmonton transportation/utility corridors.

On August 1, 1983, responsibility for Land Assembly was transferred to Alberta Public Works, Supply and Services.

ENVIRONMENTAL ASSESSMENT DIVISION

The Environmental Assessment Division is responsible for the development, maintenance and co-ordination of the department's Environmental Impact Assessment (EIA) system. Related responsibilities are the co-ordination of public participation programs and the provision of services to support the use of remote sensing technology in environmental and resource assessment.

EIAs are required for most major resource developments proposed in the province, such as new oil-sands mining projects, sour gas processing plants, coal mining projects, power plants, refineries and petrochemical facilities, pipelines, transmission lines, recreational developments and water resource projects.

On behalf of Alberta Environment, the division continued to be responsible for co-ordination of environmental matters at ERCB Public Hearings.

Environmental Impact Assessment Review Branch

The Environmental Impact Assessment Review Branch evaluates various resource development projects to determine the need for environmental impact assessment reports and co-ordinates reviews of these documents by government agencies. The branch determines the appropriate scope and content of EIA documents to ensure their relevance to decisions affecting resource development and environmental quality.

Twenty-seven projects were referred to this branch in the last fiscal year to determine the need for EIAs. As a result of these referrals, one new environmental impact assessment report was requested and six projects were determined to require co-ordinated interdepartmental reviews of environmental information.

Project Referrals to EIA Review Branch (1983-84)

Type of Project	No. of Referrals
Coal Mine	6
Gravel/Quarries	—
Pipelines	2
Hydro/Thermal Power Development	2
Gas Processing	11
Industrial	1
Recreation	1
Oil Sands	4
Total	27

Including the new EIA, there are now five EIAs before this branch. One EIA review was completed during the past year and two are still active. The remaining three EIAs are inactive as a result of proponent decisions not to proceed with their plans at this time (see Table 23).

The remaining referrals required varying degrees of branch involvement ranging from the provision of advice for review purposes to carrying out interdepartmental reviews and co-ordination of Crown participation at ERCB public hearings. The branch co-ordinated the preparation of this department and other Crown agencies for five ERCB public hearings.

The EIA Review Branch was also responsible for co-ordinating the departmental review of preliminary disclosure documents. Five of these documents were referred to this branch. In addition, the branch co-ordinated the development of draft information guidelines for the proposed Slave River Hydro Electric project and continued to assist in the implementation of the province's special waste management program.

Community Affairs Branch

The Community Affairs Branch continued to be responsible for facilitating public involvement in the regulatory procedures used to determine the balance between environmental quality and resource development on specific projects.

Environmental Impact Assessment: Communities were assisted through responses to requests for information and advice on environmental issues and the regulatory process. Branch staff advised proponents on the requirements for public participation programs and monitored proponent programs for conformity to the intent of the EIA guidelines regarding public involvement.

The branch assisted with citizen involvement in 15 industrial projects throughout the province. These included nine industrial development projects, one coal project, four oil-sands projects and one major transmission line project.

Branch staff also responded to requests from individuals and community groups planning to intervene at Energy Resources Conservation Board hearings where EIA was involved in the proponents' applications. Assistance was also provided to a number of advisory committees and special interest groups, with particular mention to the Community Advisory Committee of Cold Lake, the Genesee Power Project Advisory Committee, the Keephills Steering Committee, the Tongue Creek Area Residents, the Quirk Creek Community Gas Plant Committee, the Twin Butte Soils and Water Evaluation Task Force and the Twin Butte Times Contributor's Committee.

Departmental Projects: Branch staff aided citizen participation in many departmental water resource projects, including the South Saskatchewan River Basin Study, the Beaver River - Cold Lake Water Management Study, the Lake Wabamun Watershed Advisory Committee, the Wabamun Lake Level Advisory Committee, the Whitford Lake Water Management Study, the Paddle River Dam Implementation Committee, the Slave River Hydro Feasibility Study, the Little Bow River Basin Study, the Badger Lake Reservoir Development, the Forty-Mile Coulee Reservoir Development, the Crawling Valley Reservoir Development and the Lesser Slave Lake Regulation Project.

The branch was also responsible for liaison with a number of other government branches and departments, and branch staff directly advised and worked on special projects such as a community-based cumulative impact assessment, a province-wide workshop on sour gas and a brochure and film outlining the application process and EIA requirements for energy projects.

Alberta Remote Sensing Center

The Alberta Remote Sensing Center provided services and facilities to Albertans using Landsat (resource satellite) and airborne data for the survey and management of the province's natural resources and exploration and development in Canada's north. The center was used by provincial and federal governments, private industry, educational institutions and the public. Agencies and persons from outside Alberta, where centers do not exist, used the center on a space-available basis. Remote sensing demonstration projects were promoted, co-ordinated and funded by the center to develop cost-effective applications and use to Alberta's benefit of the federal government's national remote sensing program.

The center's staff and facilities provided assistance to multidisciplinary users in the acquisition, analysis and applications of Landsat and airborne remotely sensed data. The center's Landsat microfiche facility, image library, prime-scene index and computer access to the Canada Centre for Remote Sensing's Technical Information Service provided users with ready access to Landsat imagery of Canada and technical information.

The center provided specialized equipment, including a digital image analysis system, and staff assistance for analyzing and applying Landsat and aircraft multiband imagery. The center's education program provided briefings, lectures, workshops and displays throughout the province. The Twelfth Alberta Remote Sensing Course was conducted with participants from across Canada.

The center continued production of specially enhanced Landsat imagery for distribution to Alberta ranchers and government range-land managers.

Table 23

EIA Projects Under Review by EIA Review Branch (1983-84)

Proponent	Project	Location	Status
1. Western Decalta Ltd.	Sour Gas Plant	MD31	Complete
2. Dome Petroleum	Oil Sands Project	ID18	Active
3. Esso Minerals	Surface Coal Mine	ID14	Inactive
4. Forestburg Collieries	Surface Coal Mine	Beaver County	Inactive
5. TransAlta Utilities	500 KV Transmission Line	Calgary-Edmonton	Active

FINANCIAL STATEMENT

ALBERTA ENVIRONMENT

SUMMARY OF EXPENDITURES FOR THE 1983 84 FISCAL YEAR

Reference Number			Program/Sub-Program Element	Sub-Program Element	Program Total
01	00	00	Department Support Services		
01	00	01	Minister's Office	$ 121,667	
01	00	02	Deputy Minister's Office	334,437	
01	00	03	Finance & Office Services	1,973,266	
01	00	04	Systems & Computing	1,829,580	
01	00	05	Communications	311,430	
01	00	06	Library	311,800	
01	00	07	Personnel & Organization Development	484,785	
			Total Department Support Services		$5,366,965
02	00	00	Pollution Prevention and Control		
02	01	00	Program Support	646,406	
02	02	00	Air Quality Management	2,551,466	
02	03	00	Water Quality Management	2,392,179	
02	04	00	Municipal Water and Sewage Management	1,934,444	
02	05	00	Earth Contamination	2,716,230	
02	06	00	Waste Management	5,622,961	
02	07	00	Chemical and Pesticide Management	2,203,717	
			Total Pollution Prevention and Control		18,067,403
03	00	00	Land Conservation		
03	01	00	Program Support	2,595	
03	02	00	Land Conservation and Reclamation	2,709,192	
03	03	00	Environmental Assessment	1,189,964	
			Total Land Conservation		3,901,751
04	00	00	Water Resources Management Services		
04	01	00	Program Support	107,684	
04	02	00	Surface Water Development and Control	16,330,616	
04	03	00	Water Resources Administration	8,141,990	
04	04	00	Operation and Maintenance	8,332,071	
04	05	00	Data Collection Inventory	6,884,777	
04	06	00	Water Resources Planning and Co-ordination	5,379,618	
04	07	00	Groundwater Development	1,786,556	
			Total Water Resources Management Services		46,963,312
05	00	00	Environmental Research		
05	01	00	Environmental Research Co-ordination	1,530,292	
05	02	00	Alberta Oil Sands Environmental Research	1,899,986	
			Total Environmental Research		3,430,278
06	00	00	I.D.S.S. Land Assembly		
06	01	00	Program Support	835,996	
			Total I.D.S.S. Land Assembly		835,996
07	00	00	Interdepartmental Environment Research and Services		
07	01	01	Program Support	2,651,048	
07	02	00	Plant Sciences	1,635,692	
07	03	00	Chemistry	2,928,956	
07	04	00	Animal Sciences	2,418,465	
07	05	00	Environmental Technology	1,841,750	
			Total Interdepartmental Environment Research and Services		11,475,911
			Total Actual Expenditure for the Year		$90,041,616

ALBERTA ENVIRONMENT

SUMMARY OF EXPENDITURES AND REVENUES
FOR THE YEAR ENDED MARCH 31, 1984

ALBERTA ENVIRONMENT PROGRAM EXPENDITURES		
Departmental Support Services	$ 5,366,965	
Pollution Prevention and Control	18,067,403	
Land Conservation	3,901,751	
Water Resources Management	46,963,312	
Environmental Research	3,430,278	
I.D.S.S. Land Assembly	835,996	
Interdepartmental Environment Research and Services	11,475,911	
TOTAL		$ 90,041,616
ADVANCED EDUCATION AND MANPOWER EXPENDITURES ON BEHALF OF ALBERTA ENVIRONMENT		
Priority Employment Program (P.E.P.)	198,830	
Employment Skills Project (E.S.P.)	73,080	
Special Placement Work Experience (S.P.W.E.)	18,189	
Summer Temporary Employment Program (S.T.E.P.)	203,259	
TOTAL		493,358
HERITAGE SAVINGS TRUST FUND — ENVIRONMENTAL PROGRAMS		
Irrigation Headworks Improvement	66,619,233	
Land Reclamation	3,509,902	
Paddle River Basin Development	12,644,527	
Lesser Slave Lake Outlet	1,144,101	
TOTAL		83,917,763
TOTAL ENVIRONMENTAL EXPENDITURES		$174,452,737
REVENUE COLLECTED BY DEPARTMENT		
Water Diversion Permits	3,608	
Water Well Drilling Permits	8,776	
Water Power Rentals	343,285	
Department Miscellaneous	71,482	
Rural Water Development Program	3,075	
Previous Year Refunds	152,000	
Industrial Water Diversion	70,311	
Water Resource Revolving Fund	2,325,163	
TOTAL REVENUE COLLECTED		$2,977,700

SURFACE RECLAMATION FUND

FINANCIAL STATEMENT

MARCH 31, 1984

Auditor's Report

Balance Sheet

Notes to the Financial Statement

OFFICE OF THE AUDITOR GENERAL

ALBERTA LEGISLATURE

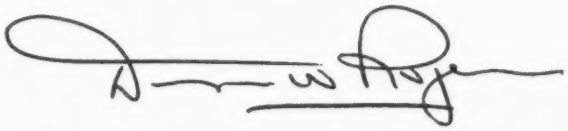
OFFICE OF THE AUDITOR GENERAL

AUDITOR'S REPORT

To the Members of the Land Conservation
and Reclamation Council

I have examined the balance sheet of the Surface Reclamation Fund as at March 31, 1984. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, this financial statement presents fairly the financial position of the Fund as at March 31, 1984 in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.



F.C.A.
Auditor General

Edmonton, Alberta
November 13, 1984

SURFACE RECLAMATION FUND

BALANCE SHEET

AS AT MARCH 31, 1984

	1984	1983
ASSETS		
Deposits in trust (Note 2)	$4,373,203	$4,649,977
Securities in trust with the Province of Alberta	116,250	150,000
	$4,489,453	$4,799,977
LIABILITIES		
Trust Fund (Note 3)	$4,489,453	$4,799,977

The accompanying notes are part of this financial statement.

SURFACE RECLAMATION FUND

NOTES TO THE FINANCIAL STATEMENT

MARCH 31, 1984

Note 1 Authority

The Surface Reclamation Fund operates under the authority of the Land Surface Conservation and Reclamation Act, Chapter L-3, Revised Statutes of Alberta 1980. The purpose of the Fund is to hold security deposits received pursuant to the Act as an assurance that satisfactory land surface reclamation will be performed. Since all interest received by the Fund is allocated and subsequently paid to depositors, no surplus or deficit arises on the Fund's operations.

Note 2 Deposits in Trust

Deposits in trust consist of deposits in the Consolidated Cash Investment Trust Fund of the Province of Alberta.

Note 3 Trust Fund

Transactions in the Trust Fund are summarized as follows:

	Cash Deposits	Securities	1984 Total	1983 Total
Balance at beginning of year	$4,649,977	$150,000	$4,799,977	$4,052,416
Security deposits received	554,420	66,250	620,670	3,396,990
Interest received	434,074	-	434,074	501,664
	5,638,471	216,250	5,854,721	7,951,070
Security deposits returned	1,265,268	100,000	1,365,268	3,151,093
Balance at end of year	$4,373,203	$116,250	$4,489,453	$4,799,977

Note 4 Bank Guarantees

In addition to the deposits in trust and securities shown on the balance sheet, the Fund held bank guarantees as at March 31, 1984 in the amount of $30,902,445 (1983 $22,444,823).

Note 5 Approval of Financial Statement

This financial statement was approved by management.

WATER RESOURCES REVOLVING FUND

FINANCIAL STATEMENTS

MARCH 31, 1984

Auditor's Report

Balance Sheet

Statement of Operations and Surplus (Deficit)

Notes to the Financial Statements

ALBERTA LEGISLATURE

OFFICE OF THE AUDITOR GENERAL

AUDITOR'S REPORT

To the Minister of Environment

I have examined the balance sheet of the Water Resources Revolving Fund as at March 31, 1984 and the statement of operations and surplus (deficit) for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Fund as at March 31, 1984 and the results of its operations for the year then ended in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

F.C.A.
Auditor General

Edmonton, Alberta
September 11, 1984

WATER RESOURCES REVOLVING FUND

BALANCE SHEET

AS AT MARCH 31, 1984

	1984	1983
ASSETS		
Current:		
Accounts receivable	$ 428,404	$ 366,355
Materials, at cost	355,378	386,339
Prepaid expense	3,314	7,392
	787,096	760,086
Fixed:		
Equipment, at cost	5,429,613	4,743,551
Less: Accumulated depreciation	2,255,588	1,768,070
	3,174,025	2,975,481
	$3,961,121	$3,735,567
LIABILITIES		
Current:		
Accounts payable	$ 292,826	$ 402,682
Provincial Treasurer's advance	3,621,712	3,461,492
	3,914,538	3,864,174
Surplus (deficit), Statement B	46,583	(128,607)
	$3,961,121	$3,735,567

The accompanying notes are part of these financial statements.

WATER RESOURCES REVOLVING FUND

STATEMENT OF OPERATIONS AND SURPLUS (DEFICIT)

FOR THE YEAR ENDED MARCH 31, 1984

	1984	1983
Revenue:		
Material and gas sales	$ 277,067	$ 297,144
Less: Cost of goods sold	261,866	276,182
Gross profit on sales	15,201	20,962
Equipment rental	2,309,962	1,953,832
	2,325,163	1,974,794
Expenses:		
Operation of equipment	1,232,946	1,197,902
Depreciation	501,020	438,297
Equipment rental	400,579	484,690
Shops	32,081	26,959
Office supplies	11,199	15,978
Communications	5,560	4,825
Maintenance	4,078	-
Freight and postage	440	1,446
Other	4,842	1,130
	2,192,745	2,171,227
Operating surplus (deficit) for the year	132,418	(196,433)
Gain on disposal of equipment	42,772	86,662
Surplus (deficit) for the year	175,190	(109,771)
Surplus (deficit) at beginning of year	(128,607)	(18,836)
Surplus (deficit) at end of year	$ 46,583	$ (128,607)

WATER RESOURCES REVOLVING FUND

NOTES TO THE FINANCIAL STATEMENTS

MARCH 31, 1984

Note 1 Authority

The Water Resources Revolving Fund operates under the authority of the Water Resources Act, Chapter W-5, Revised Statutes of Alberta 1980.

Note 2 Significant Accounting Policies and Reporting Practices

(i) Depreciation is calculated on a straight-line basis over the estimated useful life of the assets at the following rates per annum:

General equipment	- 20%
Light mobile equipment	- 25%
Tractor units and heavy equipment	- 3 1/3 to 12 1/2%
Aluminum water pipe	- 6 2/3%
Small equipment	- 33 1/3%

(ii) Major overhauls, significantly extending the life of equipment, are depreciated on a straight-line basis over periods not exceeding five years.

(iii) Materials are valued at weighted average cost.

(iv) Certain administration and other costs are provided at no charge by the Province of Alberta and accordingly are not reflected in these financial statements. These costs include salaries and wages, certain overheads and the rental charges for the Edmonton, Lethbridge, Grande Prairie and Peace River warehouses.

(v) Changes in Financial Position

A statement of changes in financial position is not provided as disclosure in these financial statements is considered to be adequate.

Note 3 Approval of Financial Statements

These financial statements were approved by management on September 11, 1984.